CRF-150

FM/AM 13-BAND
PORTABLE RADIO



SONY®

SERVICE MANUAL

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SONY®
SERVICE MANUAL

CRF-150

SUPPLEMENT

No. 2
SEPTEMBER, 1970

Subject : 1. Troubleshooting guide

2. Af circuit board changed. Serial No. { USA model 31,800 / CANADA model 50,100 / GENERAL EXPORT model 42,420 } and later.

1. TROUBLESHOOTING GUIDE

Trouble	Band	Symptom	Cause	Remedy
No sound (Af circuit normal but no sound from speaker.)	MW	1) 0.8 V or higher at the emitter of Q304. (0.6 to 0.7 V in normal)	1) Leaky tuning capacitor.	1) Apply 20 V dc between the rotor and the stator of the tuning capacitor to produce a spark.
		2) No sound even if the bar antenna coil is adjusted.	2) Defective bar antenna coil.	2) Replace the coil.
		3) Collector voltage at Q306 is too low. (2.75 V is normal.)	3) Internal resistance of the tuning meter is too high.	3) Replace the tuning meter.
	SW2~10	No sound at the high-frequency end of each band. Normal sound at the low-frequency end.	Shorted padding capacitors. (C247, C250, C253, C256, C259, C262, C265, C268, C271)	Replace these capacitors.
Low sensitivity	FM	Noise heard during reception.	Antenna lead (coaxial cable) of tuner touches the tuner case.	Resolder the lead.
	SW1	Great difference in noise level between SHARP and BROAD positions of the SELECTIVITY switch.	Yellow lead of the switch is connected to ground.	Resolder the lead.
	SW2~10	Noise heard all over the SW bands.	3.8 to 4.1 V at the emitter of Q309. (4.5 V is normal.)	Adjust R369 for 4.5 V.
Shock noise	FM	1) Shock noise.	1) Shield plate touching the CP printed circuit board.	1) Separate the shield plate from the printed circuit board.
		2) Shock noise.	2) Leads of capacitors mounted on the conductor side are touching the legs of IFTs.	2) Cover the legs of these capacitors with plastic tubing.
	MW	1) Shock noise.	1) Loose contact in the pilot lamp switch.	1) Replace the switch.
		2) Shock noise.	2) Loose nut on the EXT ANT terminal.	2) Tighten nut, then secure with contact cement.

Trouble	Band	Symptom	Cause	Remedy
Oscillation	FM	1) Oscillating noise	1) Coupling between L319 and CF301.	1) Separate L319 from CF301.
		2) Oscillating noise	2) "S" curve is too sharply adjusted.	2) Lower the "S" curve level.
		3) Oscillating noise	3) Leads from the tuner and antenna to S301-2 disturb the i-f stage.	3) Separate the leads from the printed circuit board.
Tuning meter	FM	Pointer does not move.	Leaky C377 between IFT F301 and S301-8.	Replace C377.
	MW	Minimum pointer movement.	R313 misadjusted.	Readjust R313 for 0.25 to 0.28V at the emitter of Q303.
Wrong dial pointer indication	FM		1) Pointer does not slide properly.	1) Make the pointer slide more smoothly.
			2) Incorrect frequency coverage.	2) Readjust the frequency coverage.
	MW		1) Incorrect frequency coverage.	1) Readjust the frequency coverage.
		2) Backlash.	2) Loose screw on the double gear.	2) Engage gears, and tighten the screw.
	SW2~10		1) Loose core in the first oscillator coil.	1) Fix the core with an elastic band, or replace the coil.
		2) Normal when the core of the second oscillator coil is pulled out.	2) Damaged second oscillator coil.	2) Replace the coil.
Unstable reception	SW2~10	1) No reception when the band selector is turned counterclockwise. Normal reception when the selector is turned clockwise.	1) Faulty or bent contact in the turret tuner.	1) Repair or straighten the contact.
		2) Reception okay when the set is given a mechanical shock.	2) Imperfect solder joint.	2) Resolder the defective joint.
Battery current flows when ac power supply is operating.	All	Excessively-high voltage at any point in the circuit.	Shorted D502.	Replace D502.
Reverse operation of the SELECTIVITY switch.	LW	Reverse operation on the low frequency range.	Ground foil between CF302 and CF303 is cut.	Connect the cut foil with a jumper lead.
FM tuning shaft gear skips.	FM	Tight dial	Defective gear	Deepen gear teeth, and apply lubricating oil.

SECTION 1
TECHNICAL DESCRIPTION

1-1. SPECIFICATIONS

Circuit System:	2-FET, 19-transistor, 12-diode superheterodyne
Frequency Coverage:	FM; 87 – 108 MHz (3.44 – 2.78 m) MW; 530 – 1,605 kHz (566 – 187 m) LW; 150 – 400 kHz (2,000 – 750 m) SW1; 1.6 – 4.5 MHz (187 – 67 m) SW2; 4.7 – 5.3 MHz (64 – 57 m) SW3; 5.8 – 6.4 MHz (52 – 47 m) SW4; 7.0 – 7.6 MHz (43 – 39 m) SW5; 9.5 – 10.1 MHz (31.6 – 30 m) SW6; 11.6 – 12.2 MHz (26 – 24.6 m) SW7; 15.0 – 15.6 MHz (20 – 19.2 m) SW8; 17.5 – 18.1 MHz (17 – 16.5 m) SW9; 21.4 – 22.0 MHz (14 – 13.6 m) SW10; 25.5 – 26.1 MHz (11.8 – 11.5 m)
Intermediate Frequency:	FM; 10.7 MHz MW, LW, SW1; 455 kHz SW2 – SW10; 1st: 1.55 – 2.25 MHz 2nd: 455 kHz
Antenna System:	FM; telescopic antenna or external antenna (impedance 300 Ω) MW, LW; built-in ferrite bar antenna or external antenna (high impedance) SW1; telescopic antenna or external antenna (high impedance) SW2 – SW10; telescopic antenna or external antenna (impedance 75 Ω)
Maximum Sensitivity:	FM; 1 μV (0 dB) MW; 25.1 μV/m (28 dB/m) LW; 39.8 μV/m (32 dB/m) SW1; 1 μV (0 dB) SW2 – SW10; 1 μV (0 dB)
Selectivity:	40 dB at 1,400 kHz ±10 kHz off resonance
Power Requirement:	Six "D" size flashlight batteries 9 volts in total, or house current (ac 100V, 117V, 220V, 240V)
Power Output	
at 10% distortion:	2.7W (with ac power supply), 1.1W (with battery)
maximum:	3.8W (with ac power supply), 1.7W (with battery)
Current Drain	
at zero signal:	78 mA (with ac power supply), 35 mA (with battery)
AUX IN:	
Impeadnce:	600 Ω
MPX OUT:	
Impedance:	5.1 kΩ
Level:	-40 dB (0 dB = 0.775V)
Record Out	
Impedance:	10 kΩ
Level:	-60 dB (0 dB = 0.775V)
Speaker:	3⅛" (8 cm) x 6¼" (16 cm), 4 Ω
Dimensions:	13⅜" (W) x 10 13/16" (H) x 5 11/16" (D) (340 mm x 275 mm x 144 mm)
Weight:	15 lb 7 oz (7 kg)

1-2. TECHNICAL FEATURES

* High-performance portable radio receiver with thirteen bands; FM, MW, LW, SW1-SW10.
* FET (field effect transistor) with triple-tuned passive input circuit for superior interference rejection.
* High-sensitivity and selectivity on SW bands using double-superheterodyne front end.
* High-fidelity af amplifier with OTL circuit.
* Choice of three power sources; house current, battery, car battery.

1-3. CIRCUIT DESCRIPTION

Stage/control — *Function*

Fm Tuner

FET mixer Q101

Usually an fm front end consists of an rf amplifier, mixer and local oscillator as shown in Fig. 1-1.
The rf amplifier sometimes worsens the crossmodulation handling ability of the receiver when ordinary bipolar transistors are used. It is, however, difficult to eliminate the rf amplifier because its removal causes strong spurious radiation, poor sensitivity, and a poor noise figure. To solve this problem, the Model CRF-150 uses a low-noise junction FET for the mixer and a triple-tuned passive input circuit as shown in Fig. 1-2. The Model CRF-150 is capable of clear fm reception even in strong signal-strength areas due to the extremely superior interference-rejection characteristics of the passive input circuit.

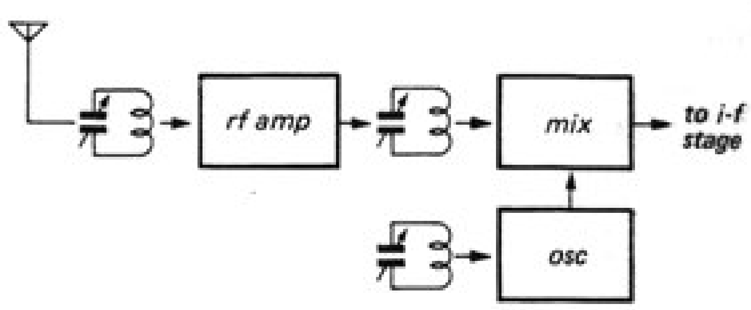


Fig. 1-1 Usual fm front end

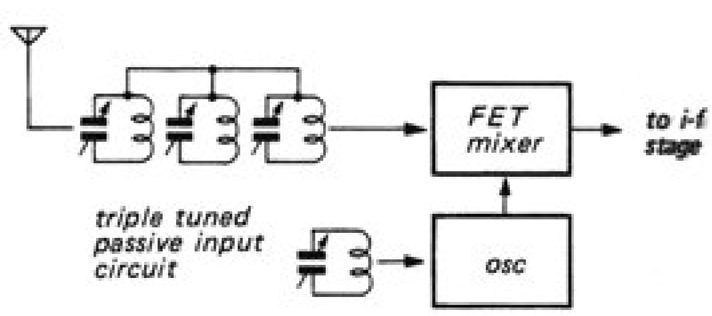


Fig. 1-2 CRF-150 fm front end

Local oscillator Q102

The oscillator generates a frequency 10.7 MHz higher than the incoming signal frequency and injects the generated voltage at the source of FET mixer Q101.

Afc diode D101

This diode is connected across the resonant circuit of the oscillator and works as a variable-capacitance diode. A dc feedback voltage from the discriminator controls the bias applied to the diode to keep the local oscillator frequency correct.

Fm i-f amplifier Q103

Transistor Q103 amplifies the 10.7 MHz i-f signal produced by mixer Q101 and coupled to it through i-f transformer IFT 101.

Sw Tuner

Double-superheterodyne

A block diagram of the sw front end is shown in Fig. 1-3. Such an arrangement effectively suppresses image signals, since the high value of the first i-f causes the desired and image signals to differ greatly in frequency. At the same time, the relatively low value of the second i-f makes it possible to obtain high amplification as well as sharp discrimination against signals differing only slightly in frequency from the desired signal.
The result is that this double-superheterodyne front end provides a combination of greater image suppression and higher adjacent channel-selectivity than can be realized in a simple superheterodyne receiver.

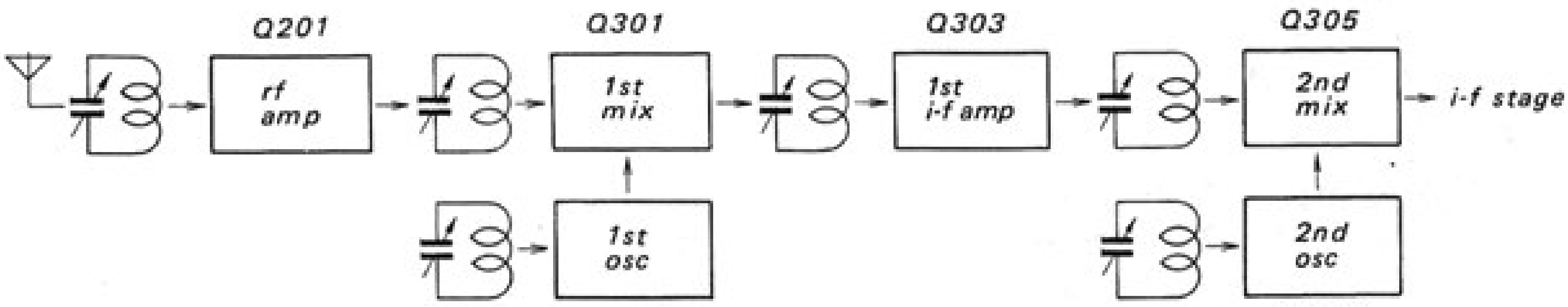


Fig. 1-3 Block diagram of the sw front end

Agc amp
Q202
D302

The agc (automatic gain control) circuit consists of transistor Q202 and diode D302. The carrier from the last stage of the i-f amplifier adds a negative agc voltage on the positively-biased base of transistor Q202 through diode D302 as shown in Fig. 1-4.

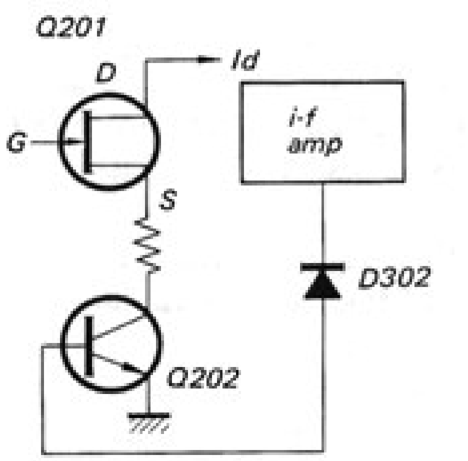


Fig. 1-4 Diagram of the agc

As the signal becomes stronger, the agc level becomes higher also.
Accordingly, the collector-current of Q202 and the drain-current of Q201 decrease. If the signal is small, Q202 increases the gain of rf amplifier Q201 and the desired sensitivity is obtained as shown in Fig. 1-5. In this way, the gain is controlled automatically.

1st local oscillator
Q203

The oscillator generates a frequency 1.55 – 2.25 MHz higher than the incoming signal frequency, and injects the generated voltage at the emitter of Q301. The oscillator frequencies are fixed in each band.

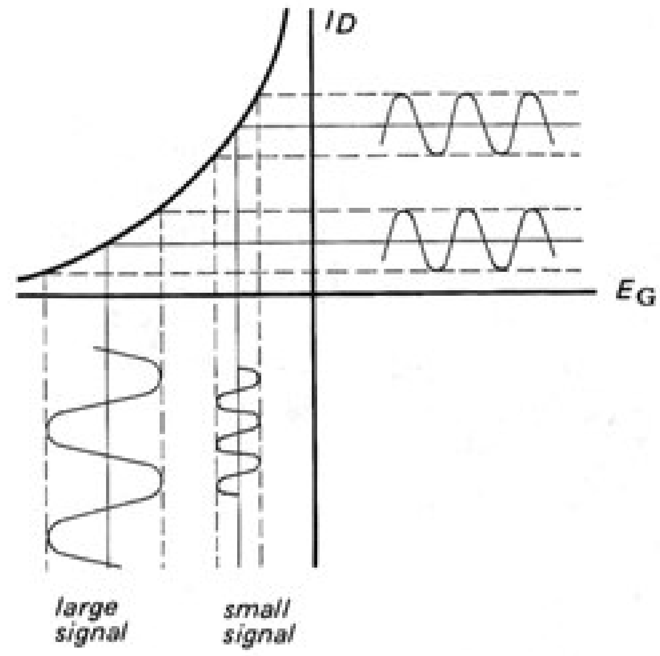


Fig. 1-5 Output waveform of the agc

I-f Strip

1st mixer
Q301

Q301 combines the signal applied to its base with the oscillator voltage (1.55 – 2.25 MHz higher than incoming signal) applied to its emitter for conversion to the 1.55 – 2.25 MHz 1st i-f.

SW 1st i-f amplifier

MW, LW rf amplifier
Q303

Q303 amplifies three a-m signals; 1.55 – 2.25 MHz (SW1 – SW10), 520 – 1,670 kHz (MW), and 145 – 410 kHz (LW).

2nd oscillator
Q304

Q304 generates a frequency 455 kHz higher than the signals that come from Q303.

Fm i-f amplifier
Q302

Q302 amplifies the 10.7 MHz fm i-f signal coupled through ceramic filters CF301 and CF302. Also, the saturation due to high base to emitter bias clips the negative peak of the ac signal voltage developed at the collector of Q302.

Limiter
D301

This diode clips the positive peak of ac signal voltage developed at the collector of Q305.

Fm i-f amplifier

A-m 2nd mixer
Q305

Q305 amplifies 10.7 MHz fm i-f signal. Also, Q305 produces a 455 kHz a-m i-f signal on its collector.

Power Supply

The CRF-150 uses a 4-pin ac cord for its power supply and has a power-in jack for a house current 100V, 117V, 220V and 240V (for USA model 117V only). However, by using the SONY DCC-2A Car Battery Cord or standard flashlight batteries (six size "D" cells), the CRF-150 can be operated away from an ac power outlet. Though diode D502 prevents a reverse current flow through the batteries when using a house current or car battery, it is better to remove the flashlight batteries if they will not be used for a while.

Sensitivity Selector

The stage selectivity is obtained by using a ceramic filter (CF304) as a frequency-selective by-pass centered at 455 kHz. This gives transistor Q304 a high gain at 455 kHz by preventing emitter degeneration of the signal at this frequency. By connecting capacitor C372 in parallel with filter CF304 (See Fig. 1-6), the BROAD selectivity bandwidth is obtained. When the SHARP position is set, the bandwidth becomes narrow. However, greater sensitivity with less noise is obtained and a weak signal can easily be heard.

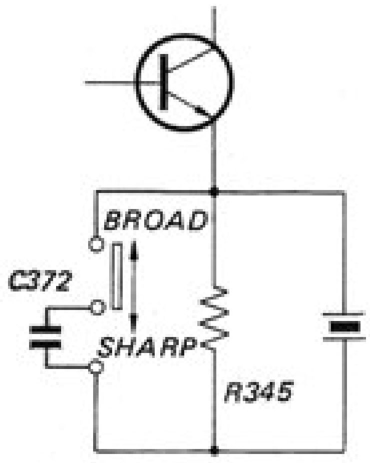


Fig. 1-6 Selectivity selection circuit

Audio Amplifier

VOLUME control
VR601

The level of signal applied to the power amplifier is determined by the setting of VR601.

Amplifier
Q401

Transistor Q401 amplifies the audio signal supplied by VOLUME control VR601.

Audio driver
Q402, Q403

These direct-coupled stages amplify the audio signal supplied by TREBLE control VR602 and BASS control VR603.

Power amplifier
Q404, Q405

This stage uses an OTL (output transformerless) push-pull class-B amplifier. Thermistors CS401 and CS402 temperaturecompensate the base bias of Q404 and Q405.
Negative feedback from the output of Q404 and Q405 to the emitter of Q403 improves the frequency response and reduces distortion.

1-4. BLOCK DIAGRAM

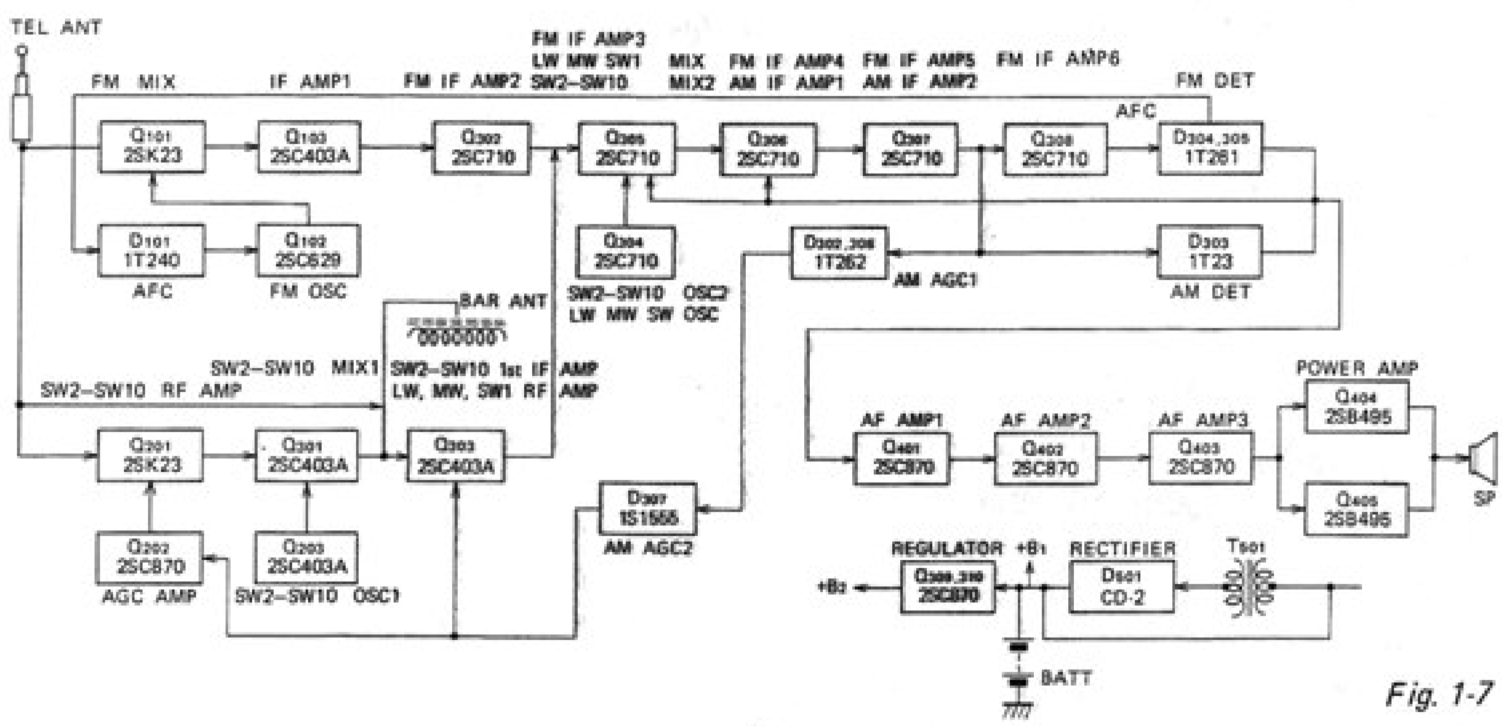


Fig. 1-7

1-5. EXTERNAL VIEW

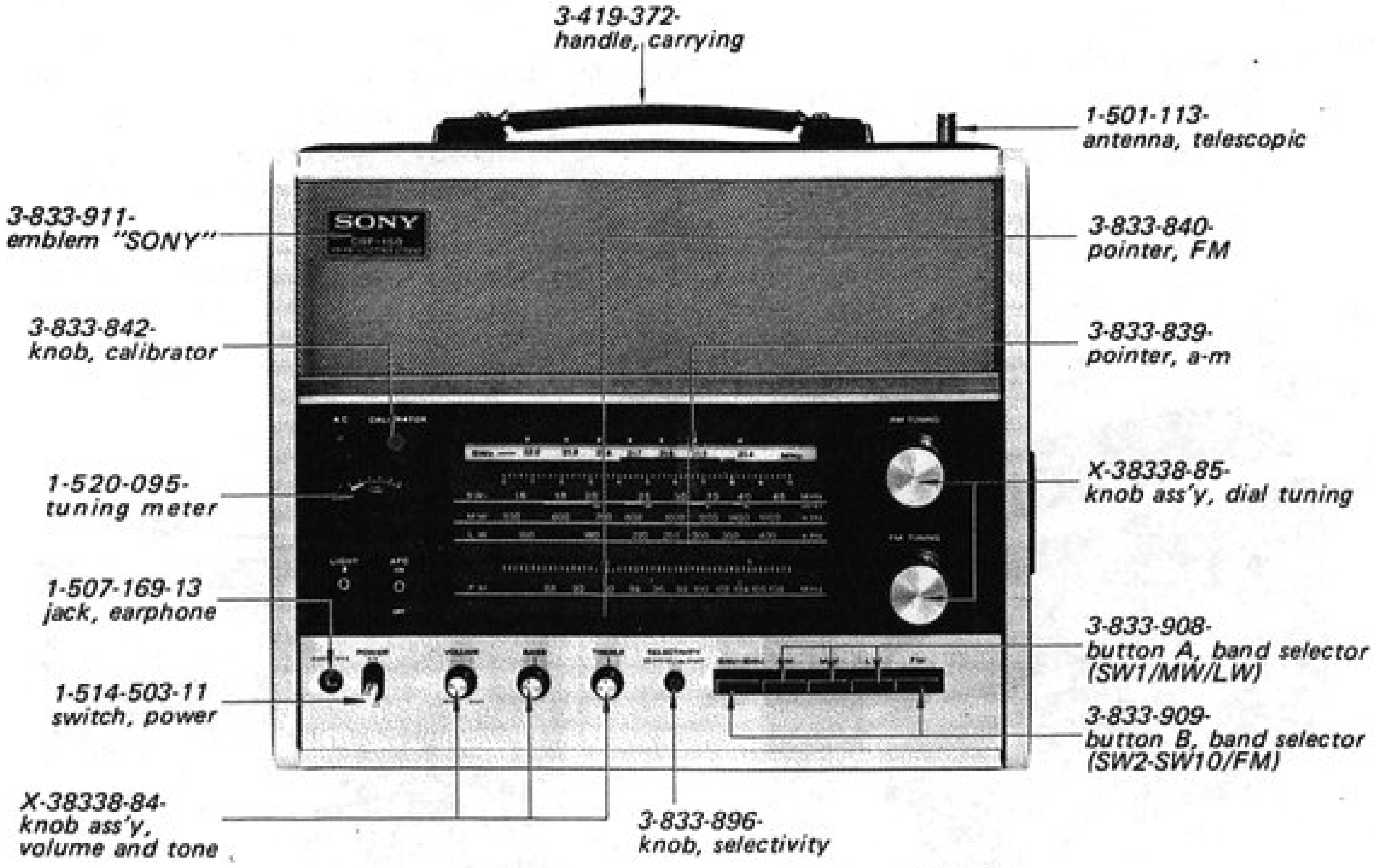


Fig. 1-8

1-6. MAJOR PARTS LOCATION

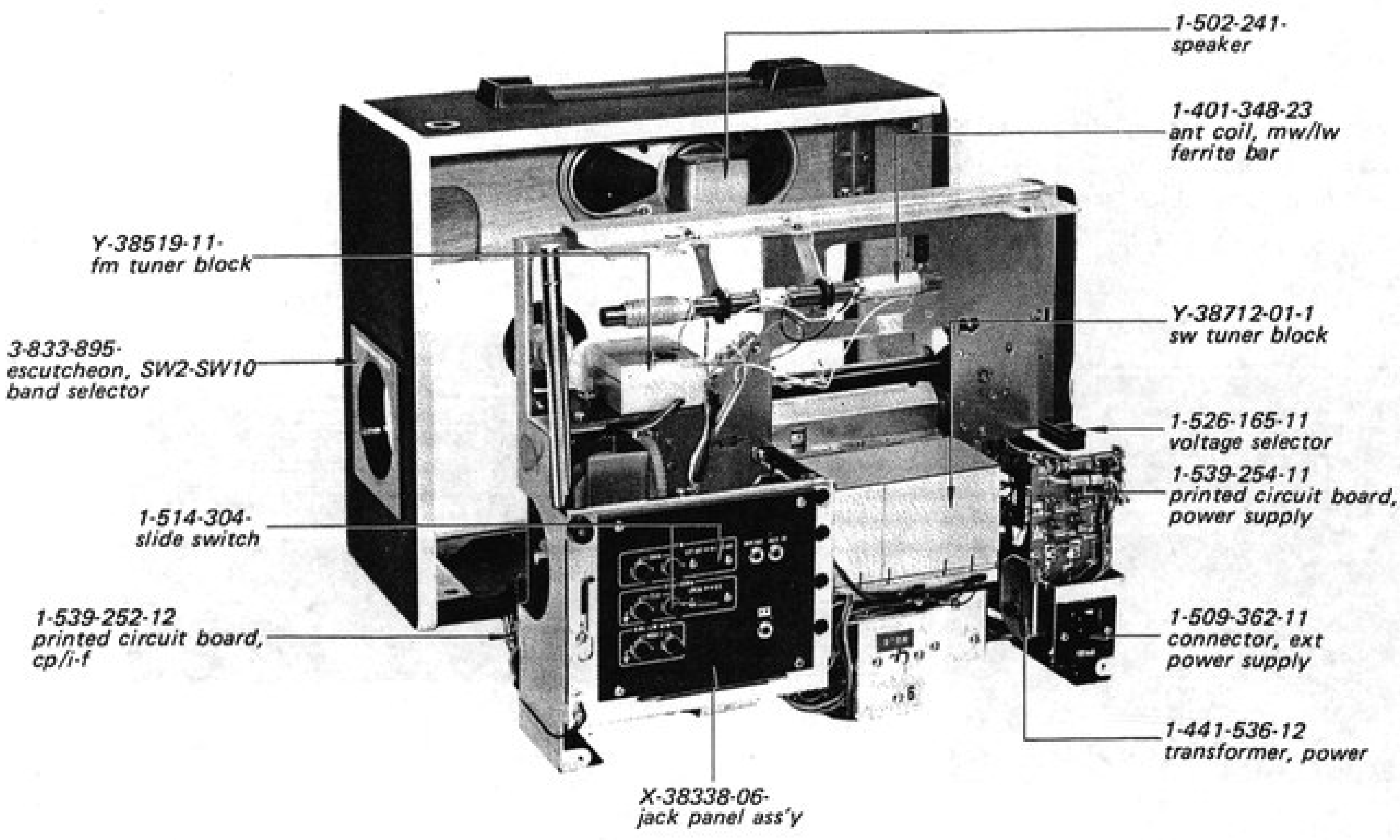


Fig. 1-9

SECTION 2
DISASSEMBLY

2-1. CHASSIS REMOVAL

1. Pull off the six knobs shown in Fig. 2-1.
2. Remove the two screws and carrying handle as shown in Fig. 2-1.

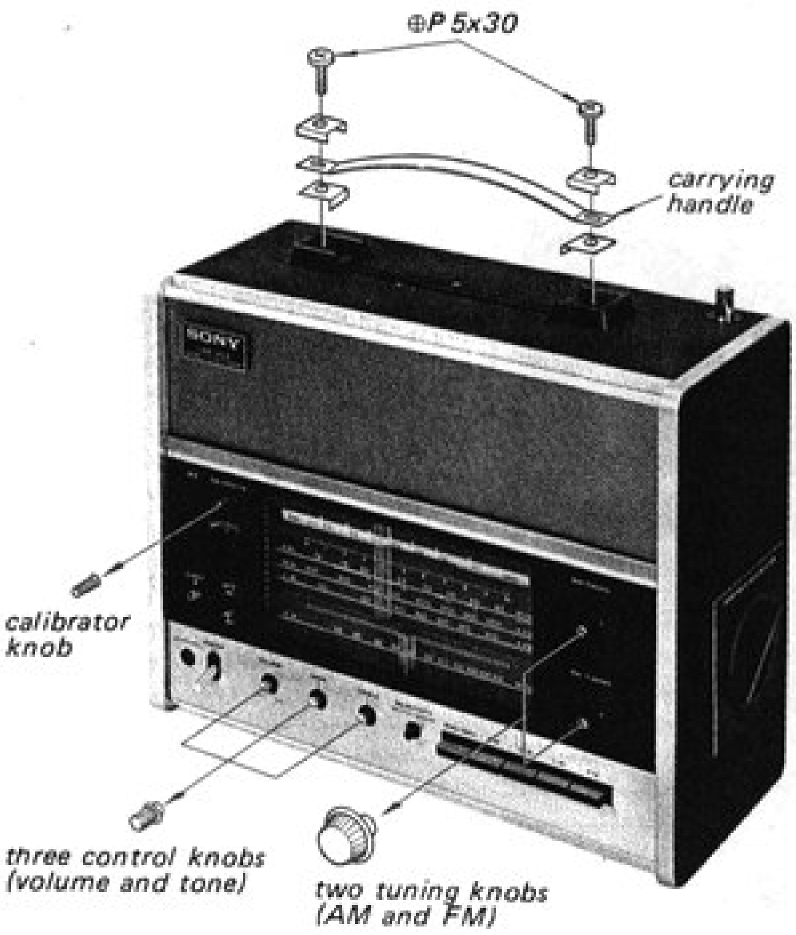


Fig. 2-1

3. Remove the battery lid and take out batteries and ac cord.
4. Remove the three screws shown in Fig. 2-2.

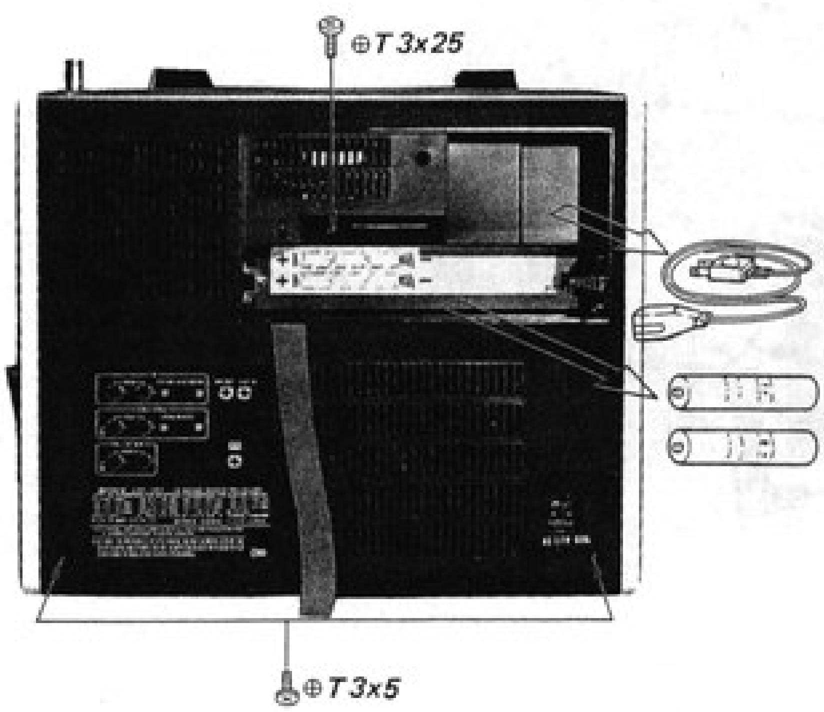


Fig. 2-2

5. Remove the four screws marked △ which fasten the front panel to the chassis in Fig. 2-3.
6. Loosen a screw marked ○ and remove the telescopic antenna.
7. Remove the speaker socket as shown in Fig. 2-3.
8. Now, the front panel is removable as shown in Fig. 2-4.
9. Remove the three screws and two rubber foots as shown in Fig. 2-4.

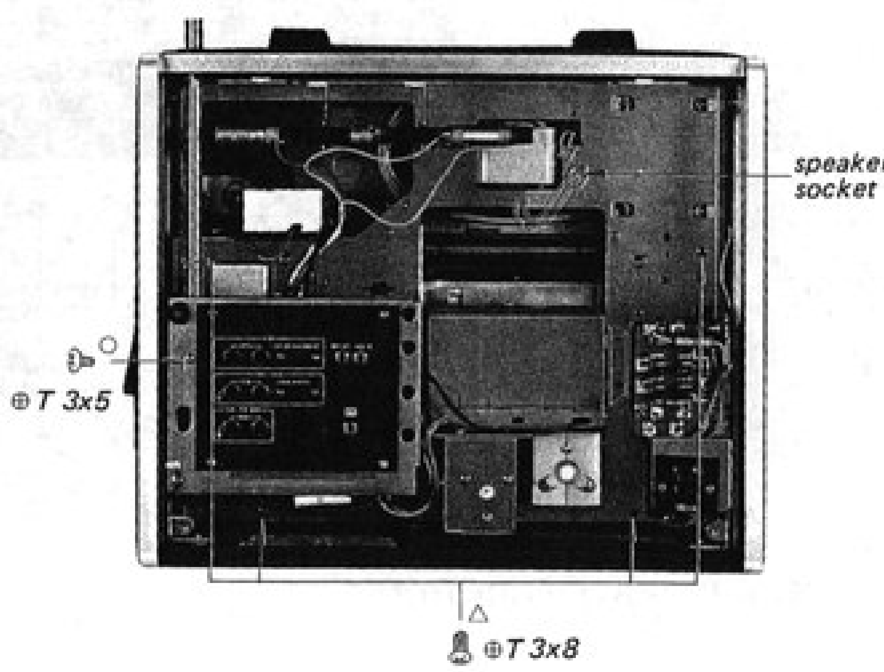


Fig. 2-3

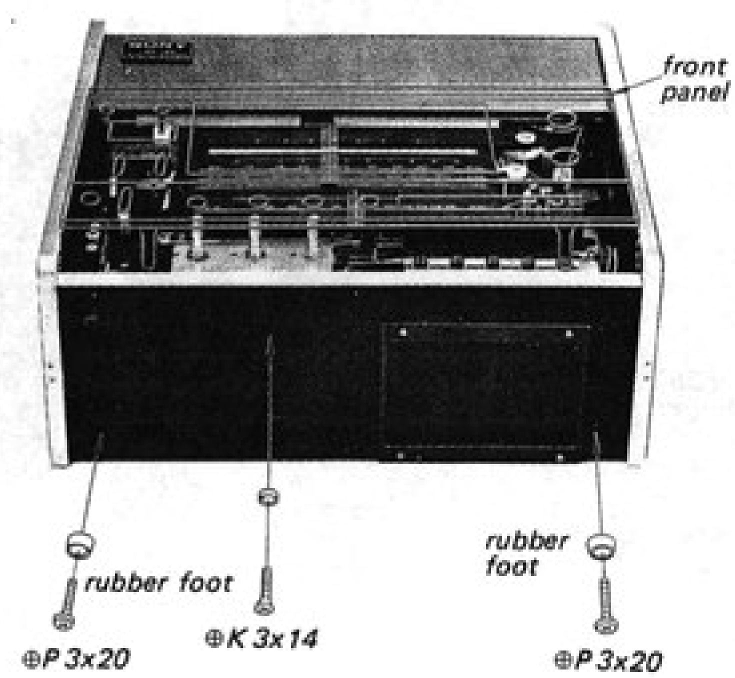


Fig. 2-4

10. Loosen the three screws and pull off the sw band selector knob as shown in Fig. 2-5.
11. Now, the chassis is removable as shown in Fig. 2-6.

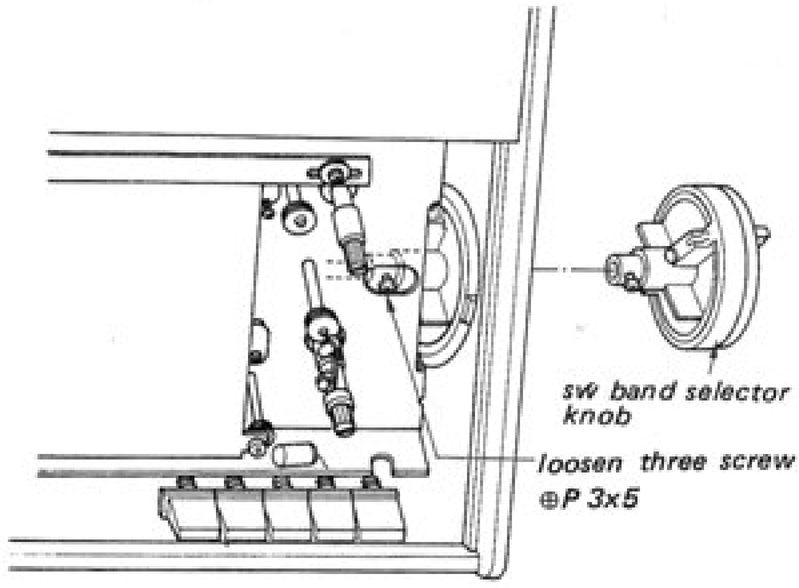


Fig. 2-5

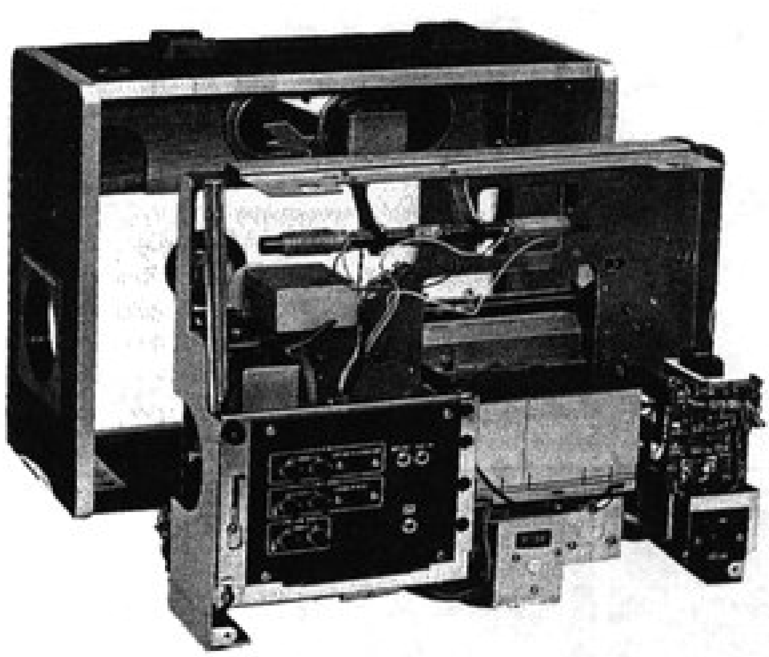


Fig. 2-6

2-2. FM TUNER REMOVAL

1. Remove the chassis.
2. Remove the seven screws marked ○ and △ in Fig. 2-7.
3. Remove the two screws marked ★.
4. Remove the screw marked ◎.
5. Unsolder the two soldered portions on the shield cover marked □.
6. Take out the shield cover and fm tuner circuit board as illustrated in Fig. 2-7.

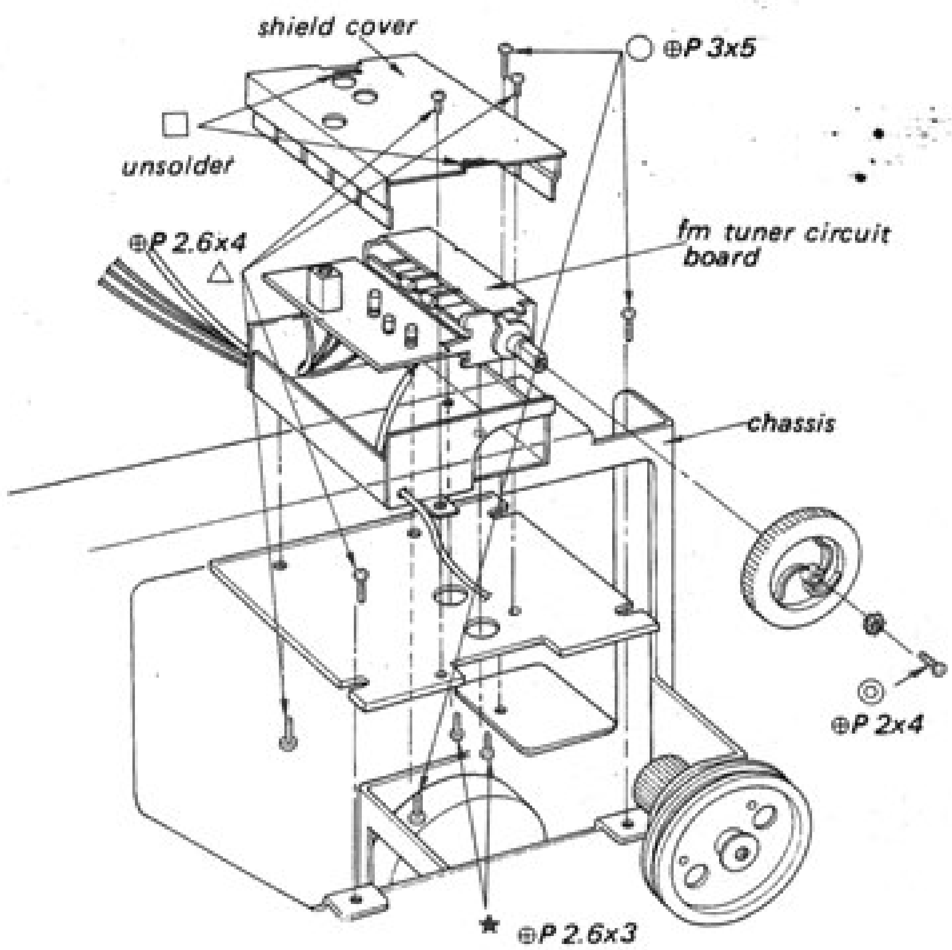


Fig. 2-7

2-3. SW TUNER REMOVAL

1. Remove the chassis.
2. Unsolder the ten lead wires shown in Fig. 2-8.

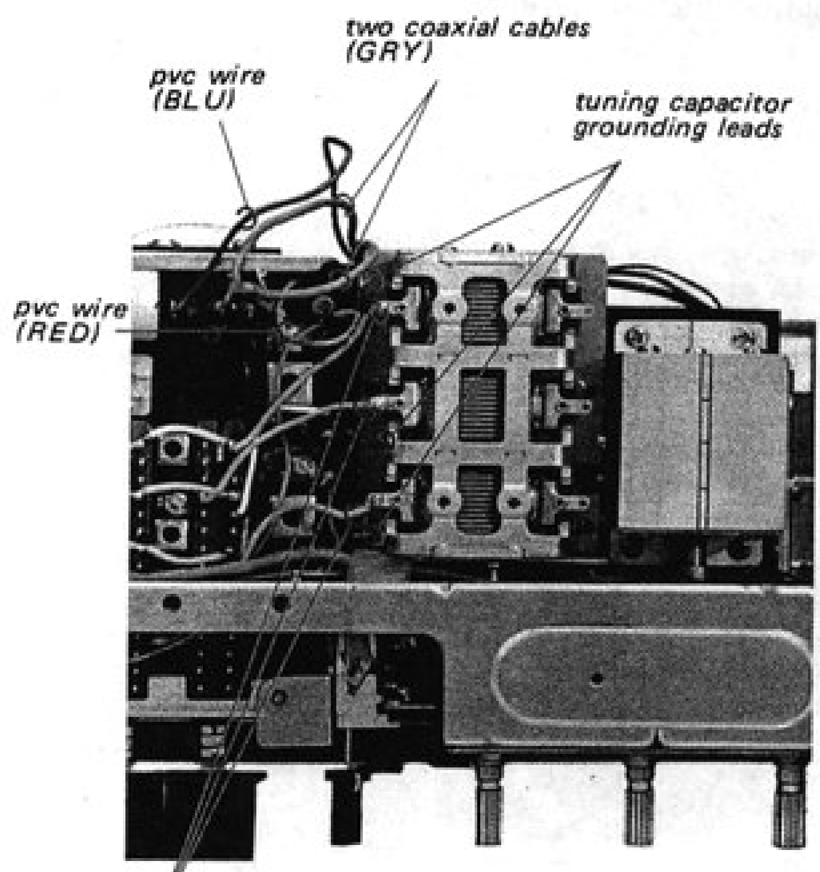


Fig. 2-8

3. Remove the five screws and the shield cover as shown in Fig. 2-9 and unsolder the two lead wires.
4. Loosen the four screws marked ○.
5. Now, sw tuner block is removable in the direction shown by the arrow.

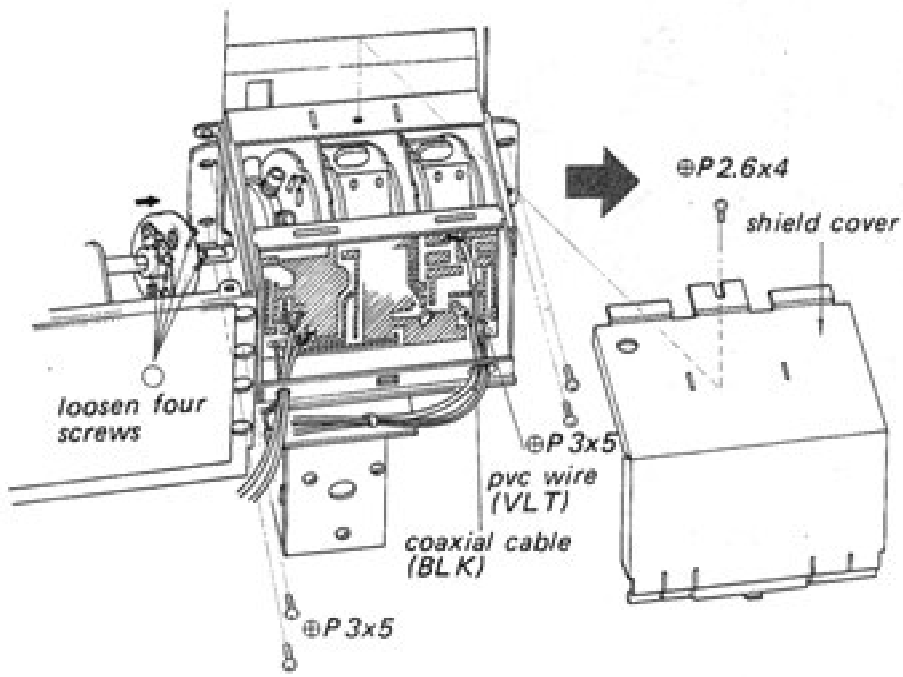


Fig. 2-9

2-4. CP/IF CIRCUIT BOARD REMOVAL

1. Unsolder the same ten lead wires in Fig. 2-8 as sw tuner removal.
2. Unsolder the six lead wires at ferrite bar antenna as shown in Fig. 2-10.

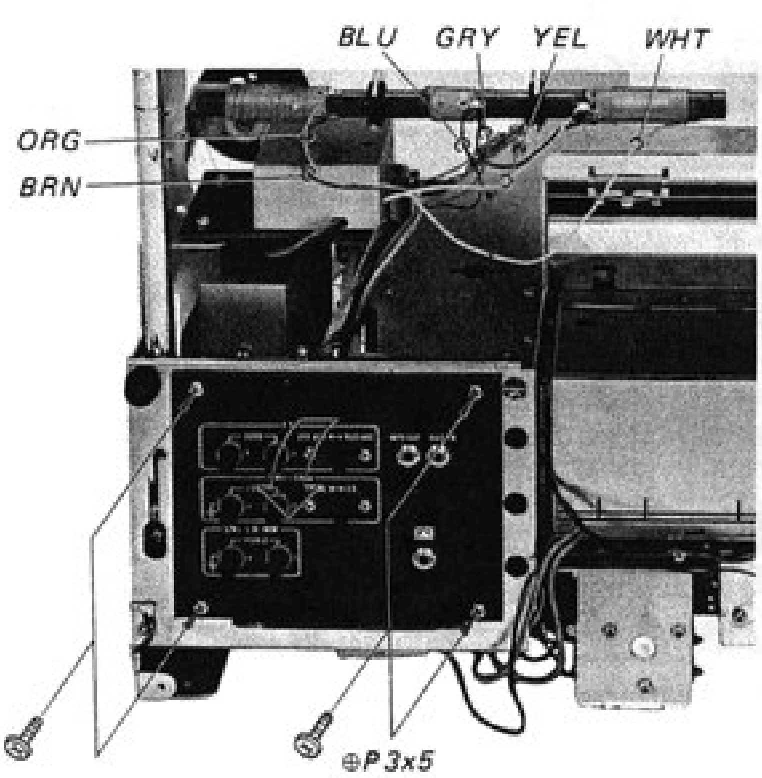


Fig. 2-10

3. Remove the four screws at the jack panel as illustrated in Fig. 2-10 and unsolder the six lead wires shown in Fig. 2-11.
4. Remove the three screws shown in Fig. 2-12.
5. Unsolder the three lead wires.
6. Loosen the four lead wires from the lead wire holding lug.
7. Slide off the CP-IF circuit board in the direction shown by the arrow in Fig. 2-12.

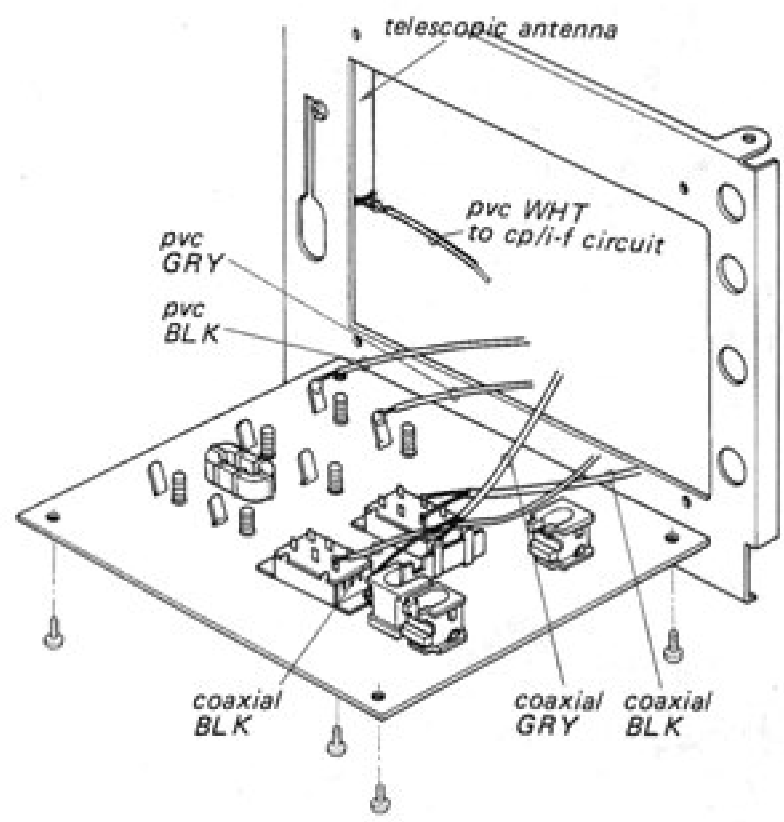


Fig. 2-11

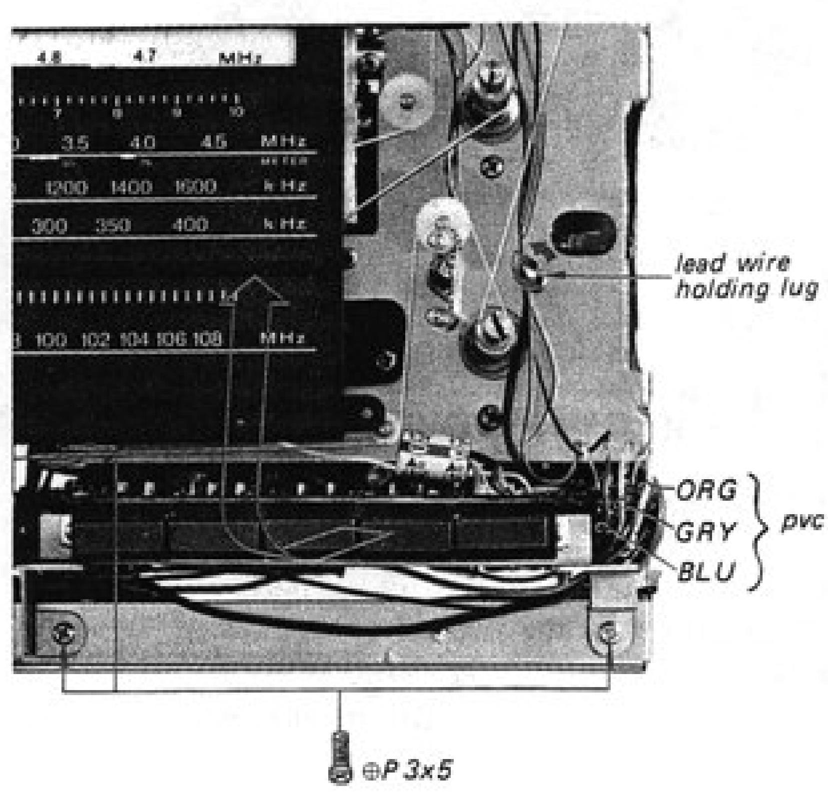


Fig. 2-12

2-5. POWER SUPPLY CIRCUIT BOARD REMOVAL

1. Remove the two screws shown in Fig. 2-13.
2. Turn the circuit board in the direction shown by the arrow.

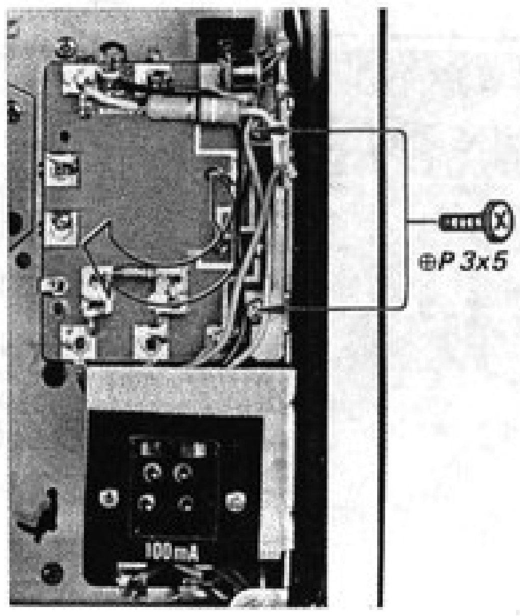


Fig. 2-13

2-6. AF CIRCUIT BOARD REMOVAL

1. Remove the four screws shown in Fig. 2-14.
2. Remove the circuit board in the direction shown by the arrow.

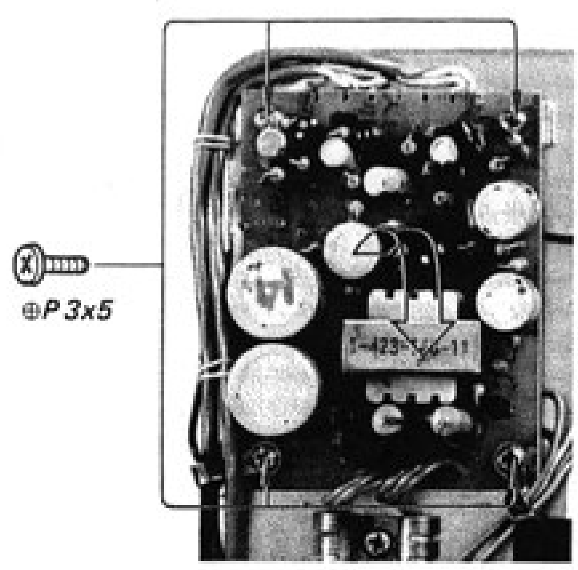


Fig. 2-14

2-7. DIAL SCALE AND DIAL DRUM REMOVAL

1. Remove the chassis.
2. Remove the four screws shown in Fig. 2-15.
3. Release the pointers from dial cords.

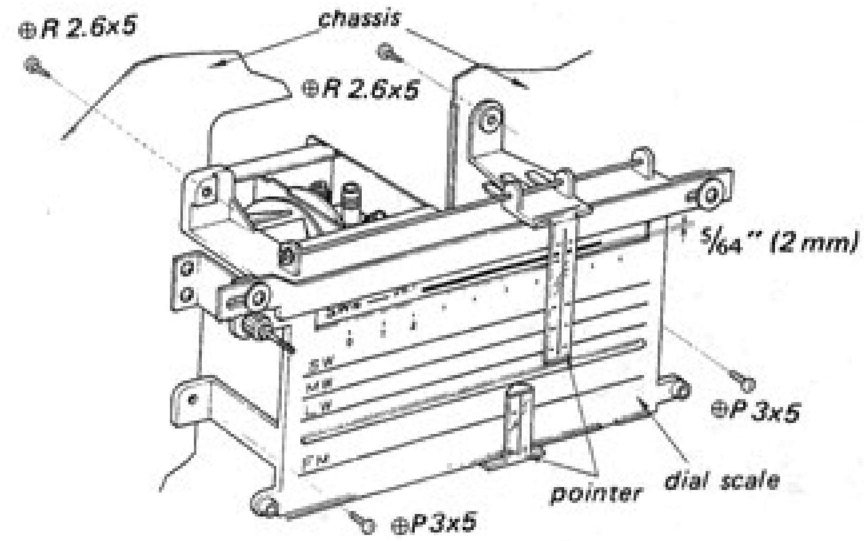


Fig. 2-15

4. Remove the dial scale.
5. Remove the drum holder A by removing the two screws marked ◎ in Fig. 2-16.
6. Release the two screws marked ☆ in Fig. 2-16.
7. Pull the dial drum towards you.

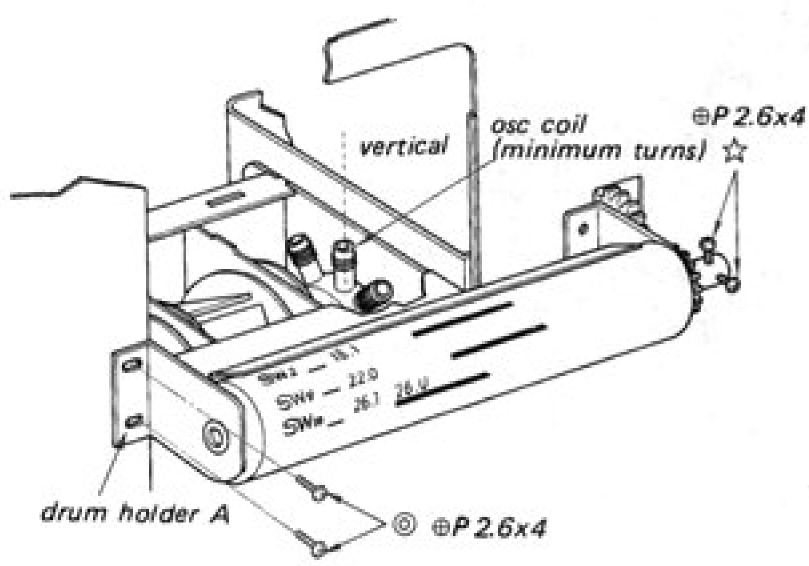


Fig. 2-16

Dial Drum Reassembly

1. Turn the sw band selector so that the osc coil which has the minimum turns comes to the vertical position as shown in Fig. 2-16.
2. Attach the dial drum to the drum holders setting the two screws marked ◎ in Fig. 2-16.
3. Set the dial scale.
4. Turn the dial drum so that the drum indicates SW10 and the distance between the dial scale and the line on the drum becomes 5/64 inches (2 mm) as shown in Fig. 2-15.
5. Fasten the two screws marked ☆ in Fig. 2-16.

2-8. DIAL CORD RESTRINGING

Preparation

1. Remove the chassis.
2. Remove the four screws shown in Fig. 2-17 and take out the dial scale.
3. Remove the volume holder by removing the two screws as shown in Fig. 2-18.
4. Rotate the driving pulley for a-m fully clockwise to its minimum capacitance position as shown in Fig. 2-19.
5. Rotate the driving pulley for fm band fully counterclockwise to its minimum capacitance position as shown in Fig. 2-20.

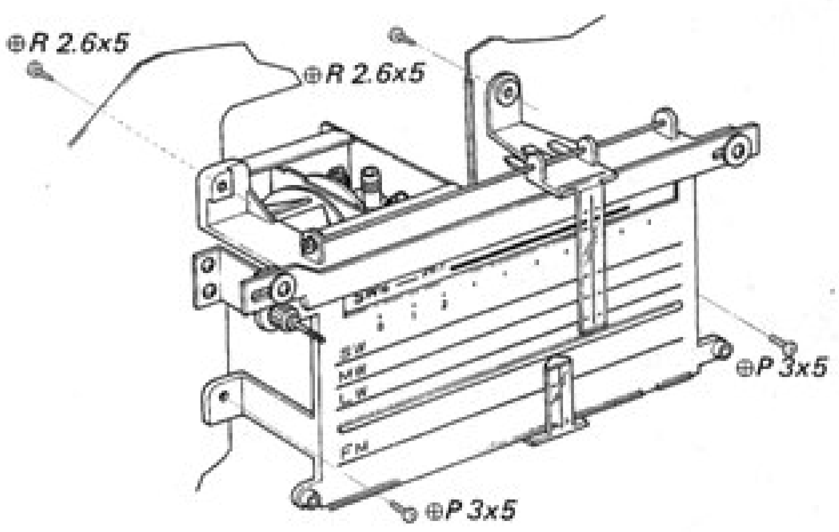


Fig. 2-17

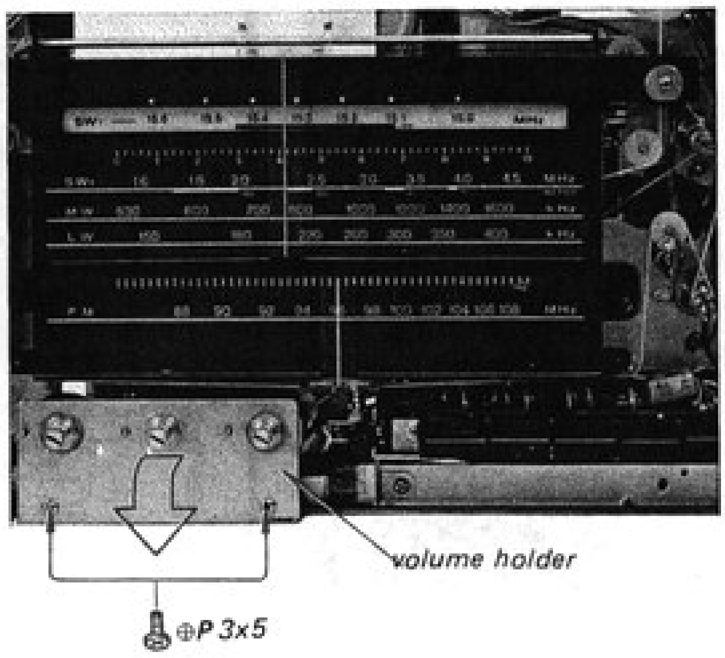


Fig. 2-18

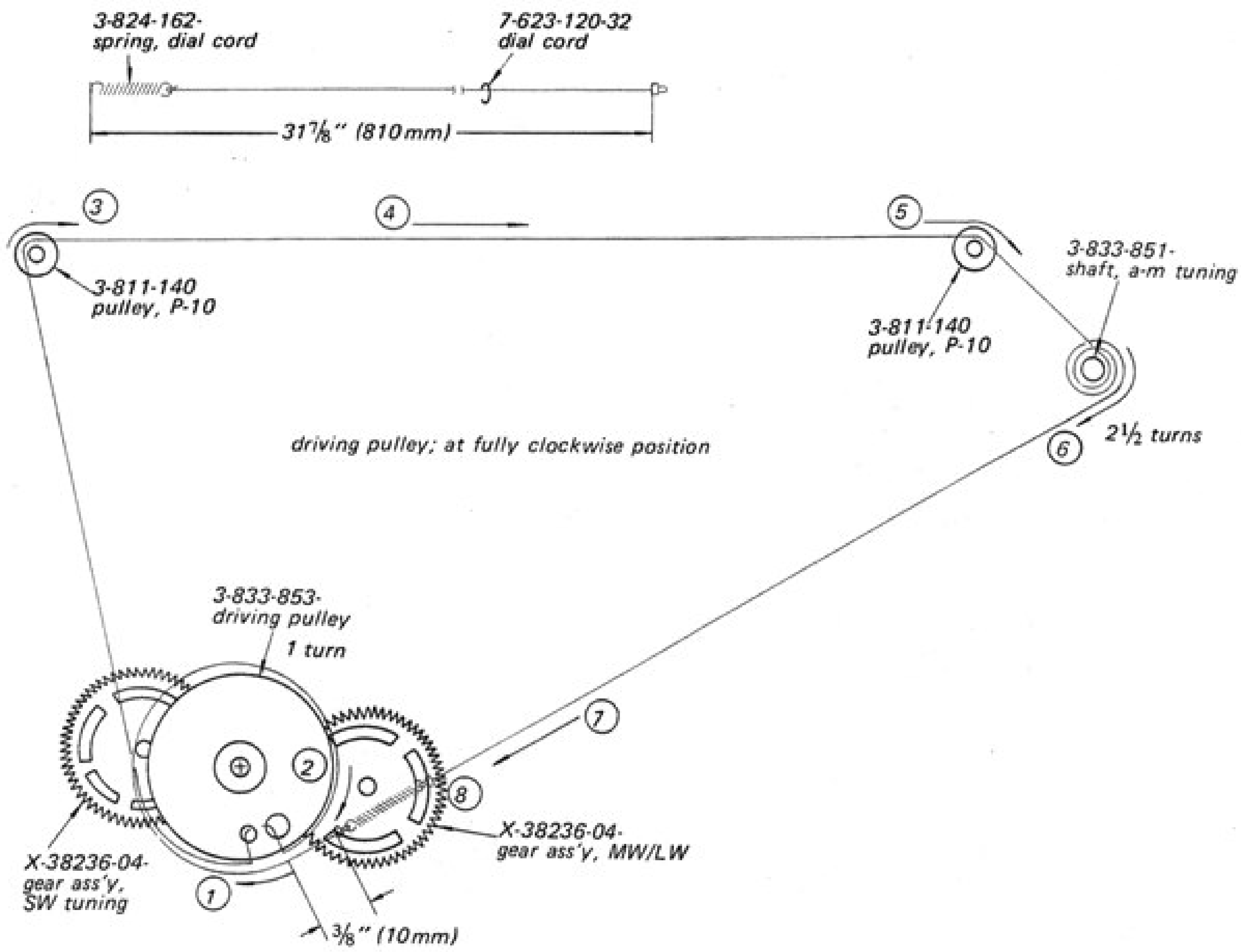


Fig. 2-19

2. Fm Tuning Capacitor Driving Cord

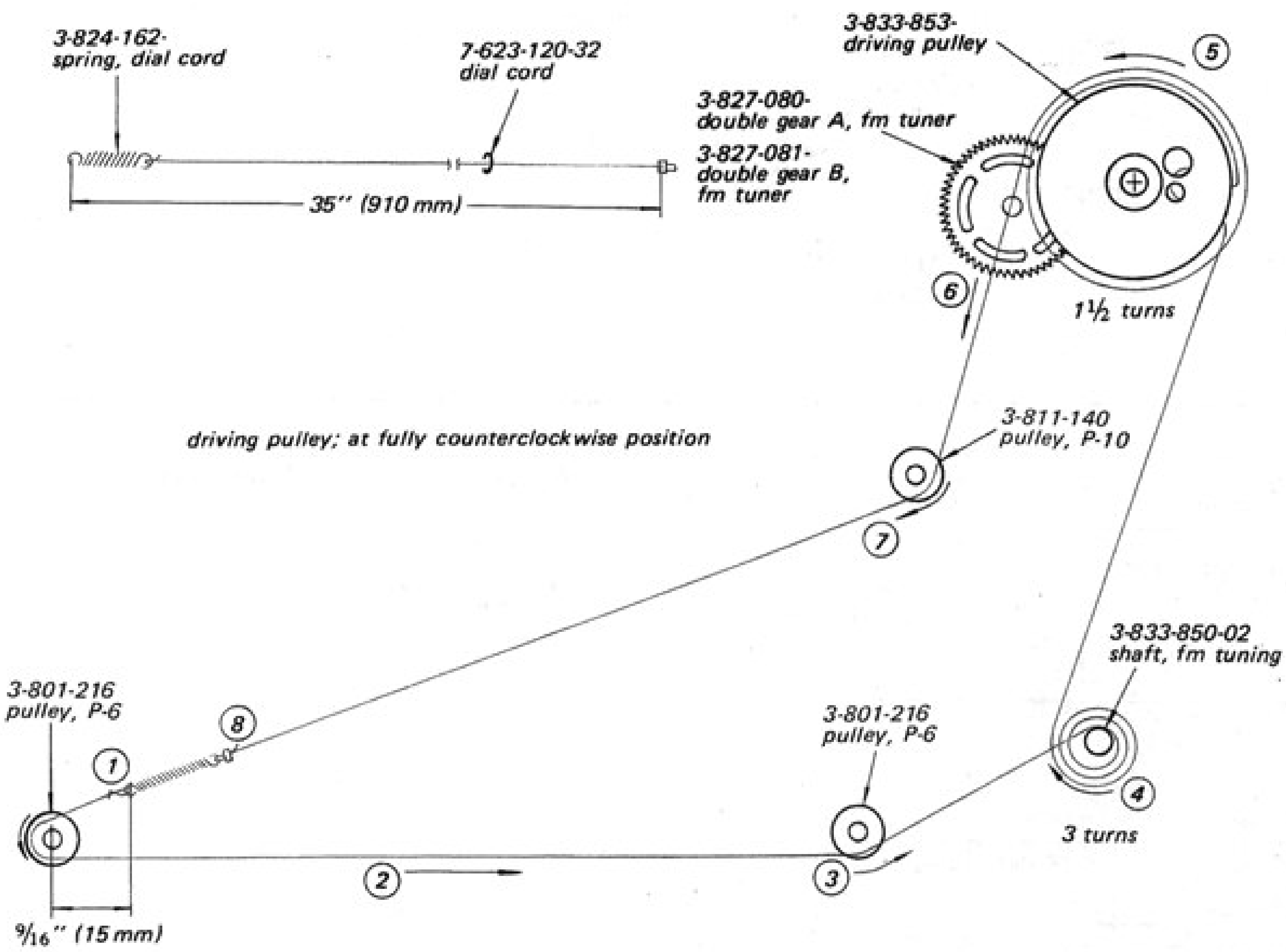


Fig. 2-20

3. Pointer Setting

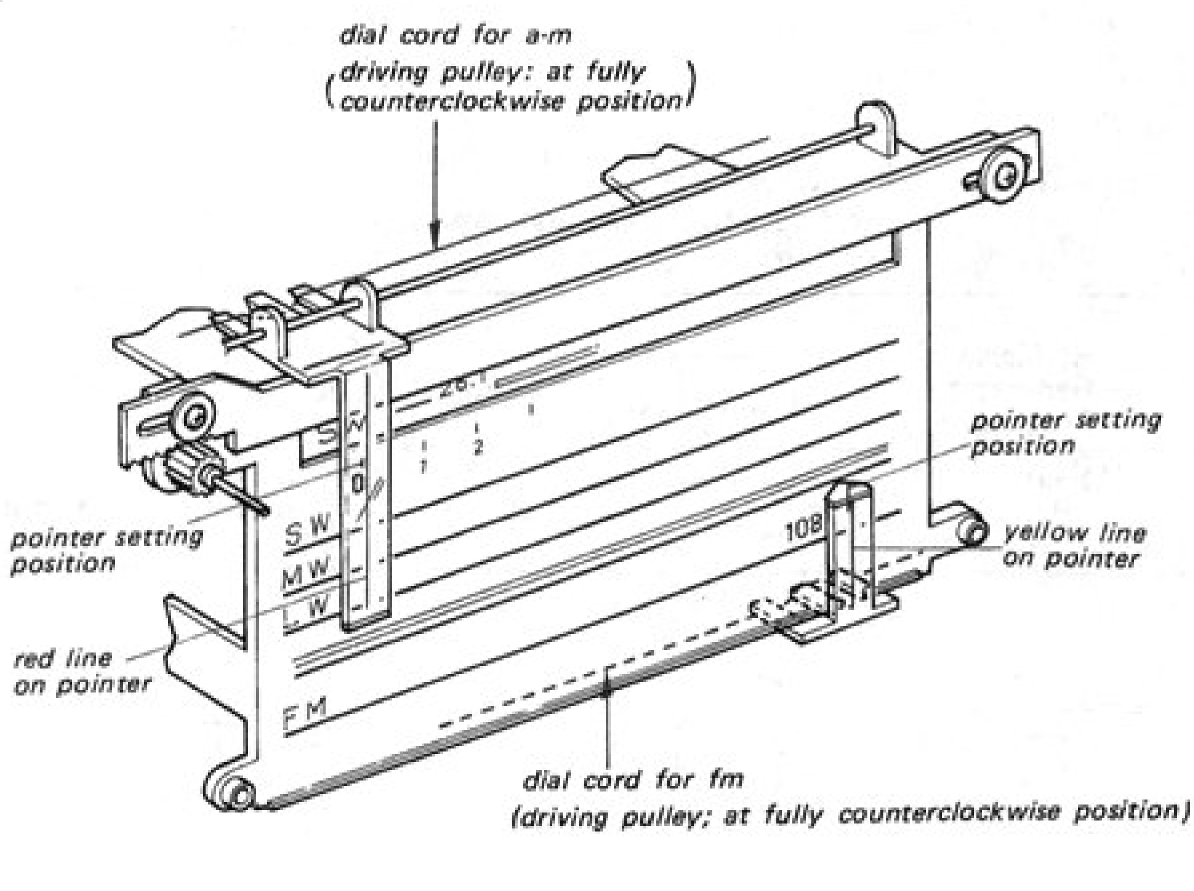


Fig. 2-21

SECTION 3
ADJUSTMENT PROCEDURES

3-1. IF ALIGNMENT

Test Equipment/Tools Required: 10.7 MHz Sweep Generator
Rf signal generator (for fm and a-m)
Oscilloscope
VTVM
Loop antenna
Screw driver for alignment

1. FM IF ALIGNMENT

Preparation: Band selector: FM
AFC: OFF
Selectivity: SHARP
Local/DX: DX

Sweep Generator Coupling	Sweep Generator Frequency	Oscilloscope Connection	Adjust	Remarks
Direct connection to EXT. ANT. 300Ω (See Fig. 3-1.)	10.7 MHz	MPX OUT jack	IFT F101 IFT F301 IFT F302 IFT F303 IFT F304	Adjust for maximum amplitude and symmetrical "S" curve on the scope. (See Fig. 3-2.) Ant. Switch: EXT. ANT.

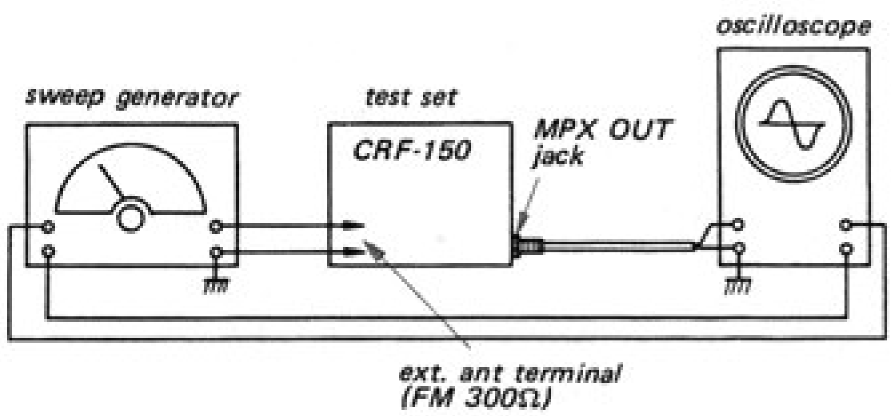


Fig. 3-1 Fm i-f alignment setup

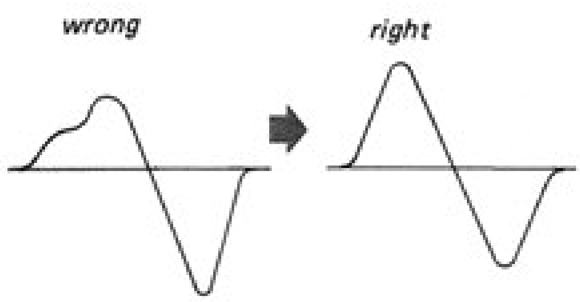


Fig. 3-2 "S" curve on oscilloscope

2. AM IF ALIGNMENT

Preparation: Band selector: MW
Tuning Capacitor: minimum capacitance position

Rf Signal Generator Coupling	Rf Signal Generator Frequency	VTVM Connection	Adjust	Remarks
Loop antenna (See Fig. 3-3.)	455 kHz (1 kHz 30% a-m modulated)	MPX OUT jack	IFT A301	Adjust for maximum meter reading.

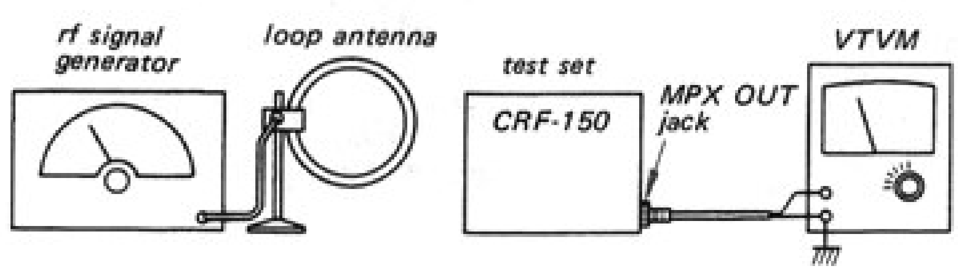


Fig. 3-3 A-m i-f alignment, MW/LW frequency coverage and tracking adjustment setup

3-2. FREQUENCY COVERAGE AND TRACKING ADJUSTMENT

Preparation: VTVM Connection: To MPX OUT jack
Modulation: FM ...... 400 Hz ± 22.5 kHz frequency-modulated signal
AM ...... 1 kHz 30% amplitude-modulated signal
AFC: OFF
Selectivity: SHARP

Adjustment	Rf Signal Generator Coupling	Rf Signal Generator Frequency	Receiver Dial Setting	Adjust	Remarks
FM Frequency Coverage	Direct connection to ext. ant. terminal FM 300Ω See Fig. 3-4.	85.5 MHz	Fully left	FM osc coil L104	Band Selector: FM Ant Switch: EXT Adjust for maximum meter reading.
		109.5 MHz	Fully right	FM osc trimmer CT1–4	
FM Tracking	The special test equipment required for this adjustment makes this strictly a factory adjustment.				
MW Frequency Coverage	Loop antenna See Fig. 3-3.	528 kHz	Fully left	MW osc coil L312	Band Selector: MW Adjust for maximum meter reading.
		1,650 kHz	Fully right	MW osc trimmer CT309	
MW Tracking		620 kHz	Tune to 620 kHz signal	MW ant coil L304–1 MW rf coil L308	
		1,400 kHz	Tune to 1,400kHz signal	MW ant trimmer CT301–2 MW rf trimmer CT305	
LW Frequency Coverage	– ditto –	145 kHz	Fully left	LW osc coil L313	Band Selector: LW Adjust for maximum meter reading.
		410 kHz	Fully right	LW osc trimmer CT310	
LW Tracking		160 kHz	Tune to 160 kHz	LW ant coil L304–2 LW rf coil L309	
		380 kHz	Tune to 380 kHz	LW ant trimmer CT301–3 LW rf trimmer CT306	
SW1 Frequency Coverage	Direct connection to ext. ant. terminal See Fig. 3-5.	1.55 MHz	Fully left	SW1 osc coil L311	Band Selector: SW1 Unsolder a blue lead shown in Fig. 3-6. Adjust for maximum meter reading.
		4.6 MHz	Fully right	SW1 osc trimmer CT308	
SW1 Tracking		1.8 MHz	Tune to 1.8 MHz	SW1 ant coil L303 SW1 rf coil L307	
		4.2 MHz	Tune to 4.2 MHz	SW1 ant trmimer CT301–1 SW1 rf trimmer CT304	

Adjustment	Rf Signal Generator Coupling	Rf Signal Generator Frequency	Receiver Dial Setting	Adjust	Remarks
SW2–SW10 1st IF Frequency Coverage	To the base of Q301 through a capacitor 0.01 – 0.04μF See Fig. 3-7 and Fig. 3-8.	1.55 MHz	Fully left	SW2–SW10, 2nd osc coil L310	Band Selector: SW2 Adjust for maximum meter reading.
		2.25 MHz	Fully left	SW2–SW10, 2nd osc trimmer CT307	
SW2–SW10 1st IF Tracking		1.6 MHz	Tune to 1.6 MHz signal	SW2–SW10, 1st i-f coil L302, L306	
		2.2 MHz	Tune to 2.2 MHz	SW2–SW10, 1st i-f trimmer CT302, CT303	
SW2 Frequency Coverage	To the SW2–SW10 ext. ant. terminal through a dummy ant. See Fig. 3-9. and Fig. 3-10.	4.65 MHz	Fully left	SW2 1st osc coil L207	Band Selector: SW2 DX-LOCAL Switch: DX Unsolder a violet lead shown in Fig. 3-10. Adjust for maximum meter reading.
SW2 Tracking		4.8 MHz	Tune to 4.8 MHz signal	SW2 – SW4 ant coil L201 rf coil L204	
		5.2 MHz	Tune to 5.2 MHz signal	SW2 ant trimmer CT201 SW2 rf trimmer CT210	
SW3 Frequecny Coverage	– ditto –	5.75 MHz	Fully left	SW3 1st osc coil L208	Band Selector: SW3 DX-LOCAL Switch: DX Adjust for maximum meter reading.
SW3 Tracking		6.3 MHz	Tune to 6.3 MHz	SW3 ant trimmer CT202 SW3 rf trimmer CT211	
SW4 Frequency Coverage	– ditto –	6.95 MHz	Fully left	SW4 1st osc coil L209	Band Selector: SW4 DX-LOCAL Switch: DX Adjust for maximum meter reading.
SW4 Tracking		7.5 MHz	Tune to 7.5 MHz	SW4 ant trimmer CT203 SW4 rf trimmer CT212	
SW5 Frequency Coverage	– ditto –	9.45 MHz	Fully left	SW5 1st osc coil L210	Band Selector: SW5 DX-LOCAL Switch: DX Adjust for maximum meter reading.
SW5 Tracking		9.6 MHz	Tune to 9.6 MHz signal	SW5–SW7 ant coil L202 rf coil L205	
		10.0 MHz	Tune to 10.0 MHz signal	SW5 ant trimmer CT204 SW5 rf trimmer CT213	
SW6 Frequency Coverage	– ditto –	11.55 MHz	Fully left	SW6 1st osc coil L211	Band Selector: SW6 DX-LOCAL Switch: DX Adjust for maximum meter reading.
SW6 Tracking		12.1 MHz	Tune to 12.1 MHz signal	SW6 ant trimmer CT205 SW6 rf trimmer CT214	

Adjustment	Rf Signal Generator Coupling	Rf Signal Generator Frequency	Receiver Dial Setting	Adjust	Remarks
SW7 Frequency Coverage	– ditto –	14.95 MHz	Fully left	SW7 1st osc coil L212	Band Selector: SW7 DX-LOCAL Switch: DX Adjust for maximum meter reading.
SW7 Tracking		15.5 MHz	Tune to 15.5 MHz signal	SW7 ant trimmer CT206 SW7 rf trimmer CT215	
SW8 Frequency Coverage	– ditto –	17.45 MHz	Fully left	SW8 1st osc coil L213	Band Selector: SW8 DX-LOCAL Switch: DX Adjust for maximum meter reading.
SW8 Tracking		17.6 MHz	Tune to 17.6 MHz signal	SW8 – SW10 ant coil L203 rf coil L206	
		18.0 MHz	Tune to 18.0 MHz signal	SW8 ant trimmer CT207 SW8 rf trimmer CT216	
SW9 Frequency Coverage	– ditto –	21.35 MHz	Fully left	SW9 1st osc coil L214	Band Selector: SW9 DX-LOCAL Switch: DX Adjust for maximum meter reading.
SW9 Tracking		21.9 MHz	Tune to 21.9 MHz	SW9 ant trimmer CT208 SW9 rf trimmer CT217	
SW10 Frequency Coverage	– ditto –	25.45 MHz	Fully left	SW10 1st osc coil L215	Band Selector: SW10 DX-LOCAL Switch: DX Adjust for maximum meter reading.
SW10 Tracking		26.0 MHz	Tune to 26.0 MHz	SW10 ant trimmer CT209 SW10 rf trimmer CT218	

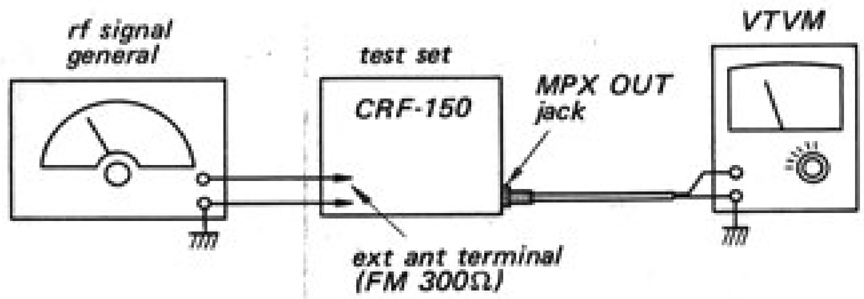


Fig. 3-4 Fm frequency coverage and tracking adjustment setup

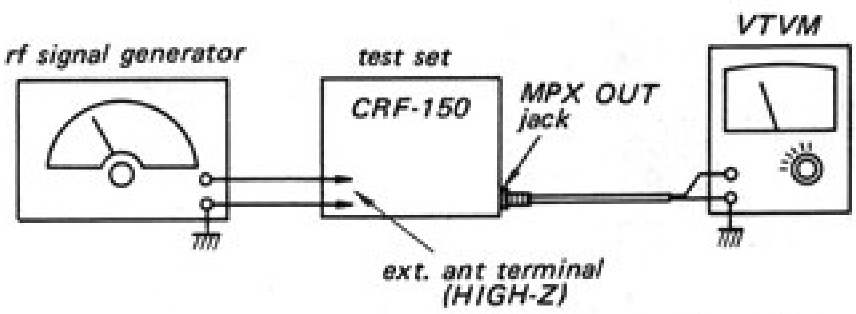


Fig. 3-5 SW1 frequency coverage and tracking adjustment setup

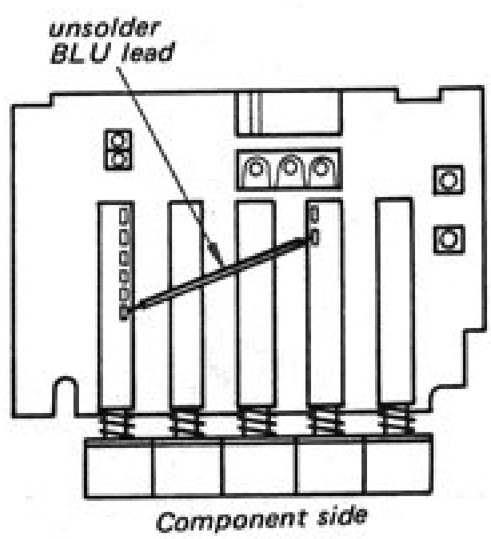


Fig. 3-6 Blue lead on cp circuit board

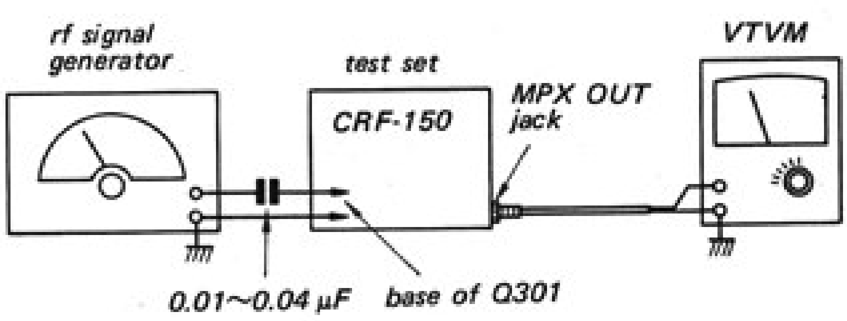


Fig. 3-7 SW2-SW10 1st i-f frequency coverage and tracking adjustment setup

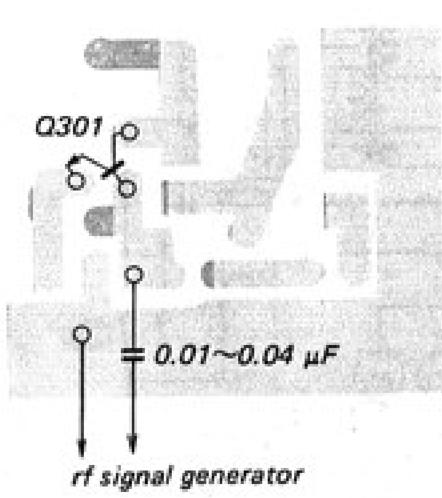


Fig. 3-8 Signal generator connection

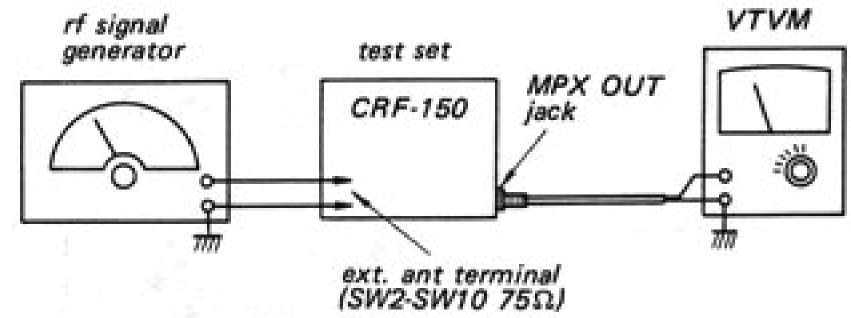


Fig. 3-9 SW2-SW10 frequency coverage and tracking adjustment setup

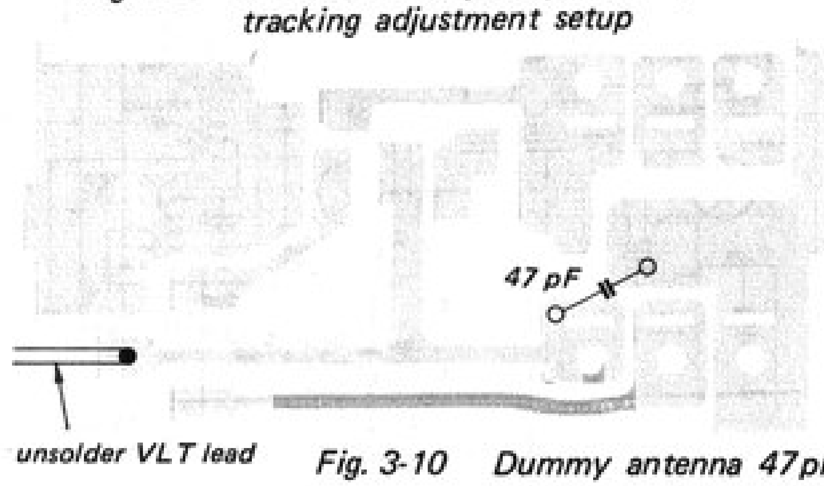


Fig. 3-10 Dummy antenna 47pF on sw tuner front end

3-3. ADJUSTING PARTS LOCATIONS

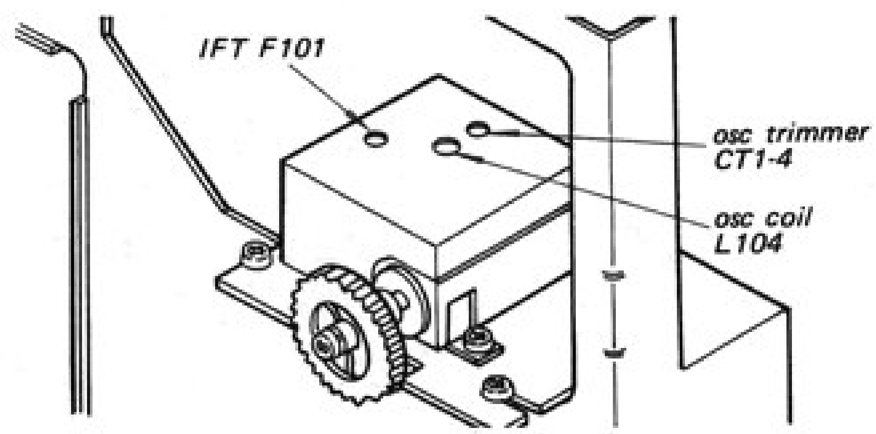


Fig. 3-11 Fm tuner block adjustments on fm tuner block

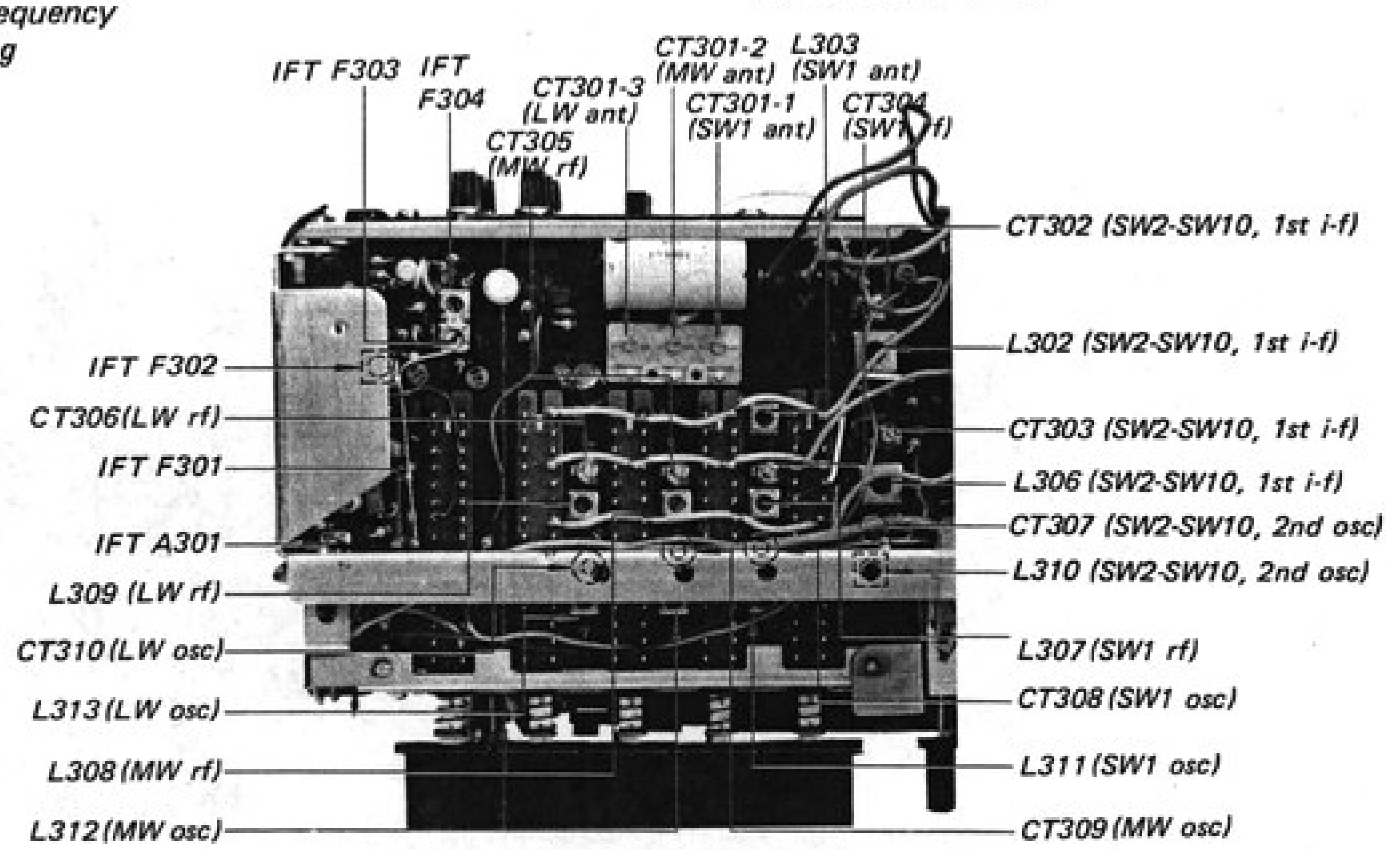


Fig. 3-12 Cp/i-f circuit board adjustments

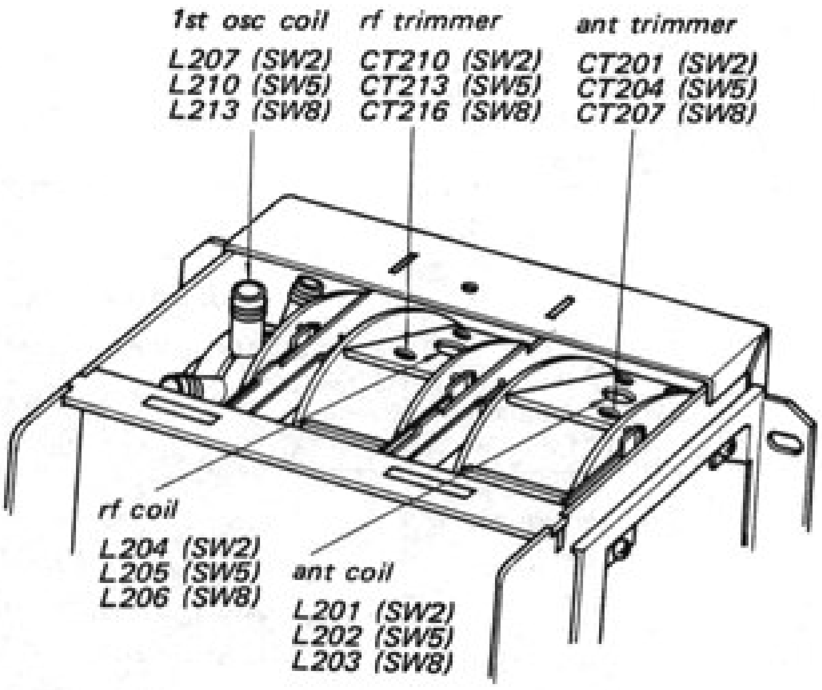


Fig. 3-13 Adjusting parts for SW2, SW6, SW8

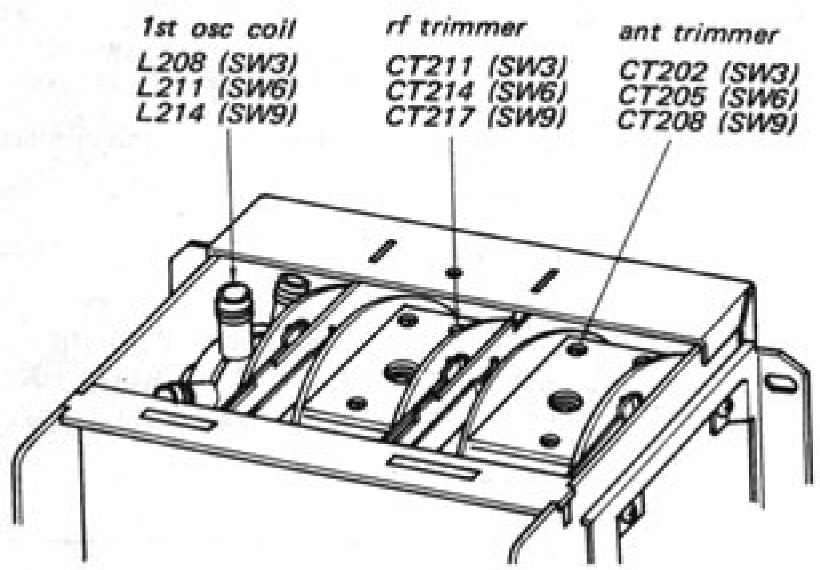


Fig. 3-14 Adjusting parts for SW3, SW6, SW9

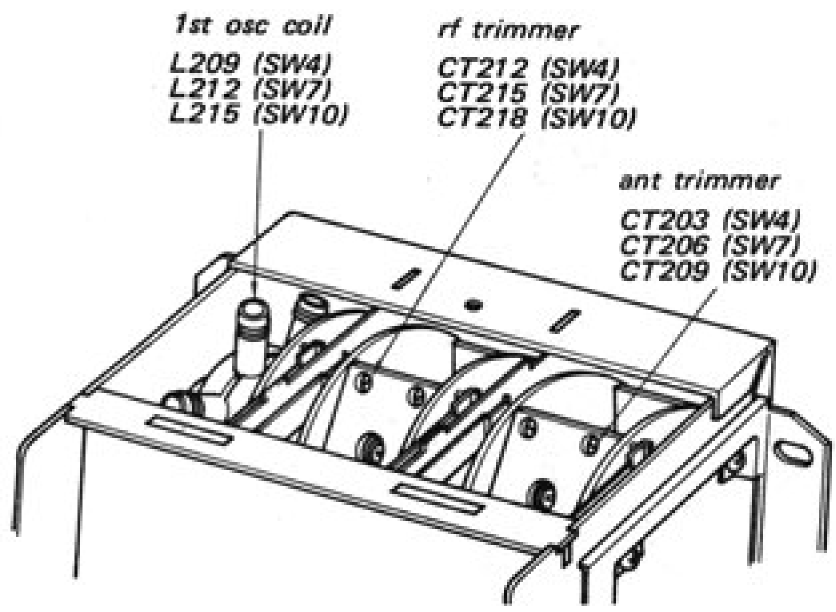


Fig. 3-15 Adjusting parts for SW4, SW7, SW10

3-4. VOLTAGE AND CURRENT ADJUSTMENT

1. Regulator Voltage

Parts to be selected: R369
Band selector: MW
Power requirement: ac
Adjustment: R369 must be selected to obtain 4.5V at emitter of Q309.

R369: ¼W carbon resistor,

1-244-670-	750Ω
1-244-671-	820Ω
1-244-672-	910Ω
1-244-673-	1 kΩ
1-244-674-	1,100Ω
1-244-675-	1,200Ω

2. A-m I-f Current

Parts to be selected: R338
Band selector: MW
Power requirement: ac
Adjustment: R338 must be selected to obtain 0.27V at emitter of Q306.

R338: ¼W carbon resistor,

1-244-720-	91 kΩ
1-244-721-	100 kΩ
1-244-722-	110 kΩ
1-244-723-	120 kΩ
1-244-724-	130 kΩ
1-244-725-	150 kΩ
1-244-726-	160 kΩ

3. Fm I-f Current

Parts to be selected: R343
Band selector: FM
Power requirement: ac
Adjustment: R343 must be selected to obtain 0.31V at emitter of Q306.

R343: ¼W carbon resistor,

1-244-672-	910Ω
1-244-673-	1 kΩ
1-244-674-	1,100Ω
1-244-675-	1,200Ω
1-244-676-	1,300Ω
1-244-677-	1,500Ω

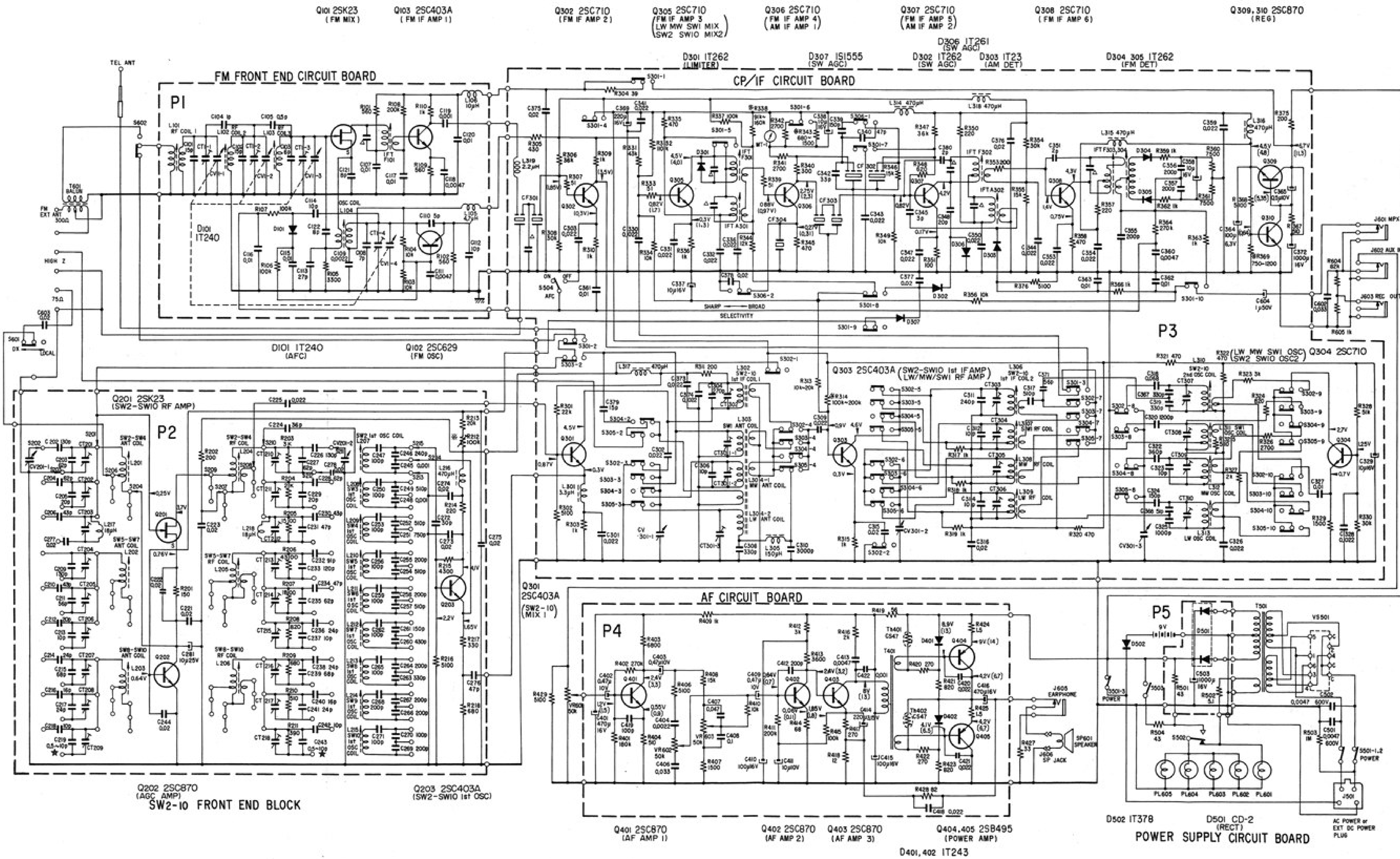
4. Sw Agc Bias

Parts to be adjusted: R212 (100 kΩ adjustable)
Band selector: SW2–SW10
Power requirement: ac or dc
Adjustment: R212 must be adjusted to obtain 0.5V across resistor R201.

CRF-150

SECTION 4
SCHEMTIC AND MOUNTING DIAGRAMS

4-1. SCHEMATIC DIAGRAM



Note:

1. ⏚ shows grounding to the chassis.
2. All resistors and capacitors are in Ω and μF, unless otherwise indicated.
3. Capacitors marked △ are built in i-f transformers.
4. Capacitors marked ★ are added for the unit that the best tracking point is out of the adjustable range.
5. The symbol ※ indicates a component whose value is selected to yield normal operating condition.
6. Voltage values are measured from point indicated to ground circuit with a dc voltmeter (20kΩ/V) and current values are measured with a dc ammeter.
   Voltage and current values are taken with no radio signal received.
7. The values shown in (   ) are taken with fm reception and in [   ] with ac power input.
8. Variations may be noted due to normal production tolerances.

Switch Functions

Ref. No.	*Description*	*Mode*
S201-215	Band Selector, SW2-SW10	SW2
S301	Band Selector, FM	OFF
S302	Band Selector, SW2-SW10	OFF
S303	Band Selector, SW1	OFF
S304	Band Selector, MW	ON
S305	Band Selector, LW	OFF
S306	SELECTIVITY BROAD-SHARP	BROAD
S501	Power ON-OFF	ON
S502	Pilot Lamp	ON
S503	EXT DC Power	OFF
S504	AFC ON-OFF	ON
S601	SENSITIVITY DX-LOCAL	DX

S301–S305	*OFF*	*ON*
S306	*SHARP*	*BROAD*
S601	*DX*	*LOCAL*

When ordering replacement parts, you should use PART NUMBER listed on the Complete Spare Parts List attached herewith. The symbol number should not be used for ordering purposes.

—— Hardware Nomenclature ——

- **P** – Pan Head Screw
- **PS** – Pan Head Screw with Spring Washer
- **K** – Flat Countersunk Head Screw
- **B** – Binding Head Screw
- **RK** – Oval Countersunk Head Screw
- **T** – Truss Head Screw
- **R** – Round Head Screw
- **F** – Flat Fillister Head Screw
- **SC** – Set Screw
- **E** – Retaining Ring (E Washer)

W – Washer
SW – Spring Washer
LW – Lock Washer
N – Nut

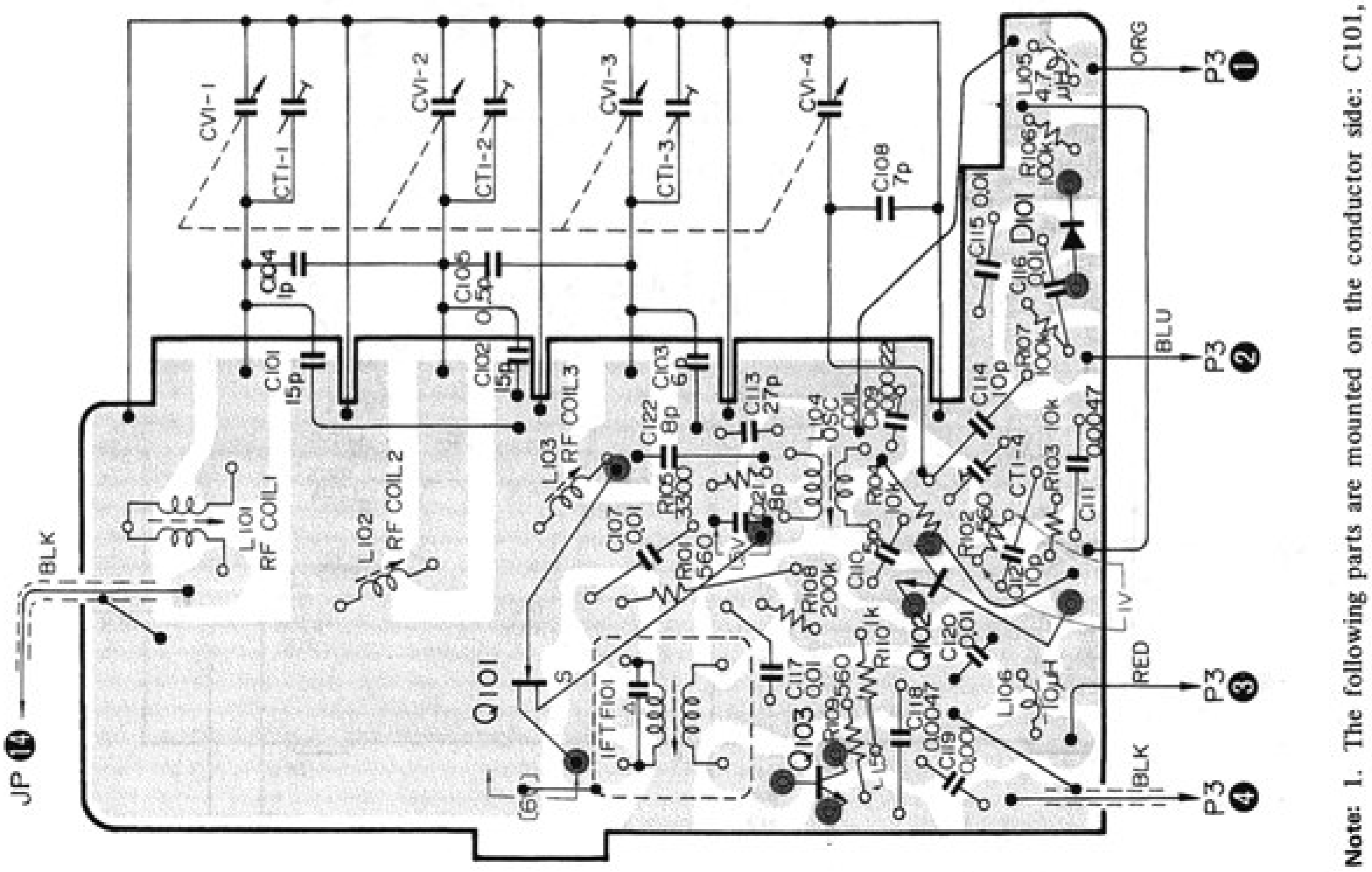
– Example –

⊕ P 3x10

- ⊕ – Type of Slit
- P – Type of Head
- 3 – Diameter in mm (D)
- 10 – Length in mm (L)

4-2. FM TUNER CIRCUIT BOARD (P1)

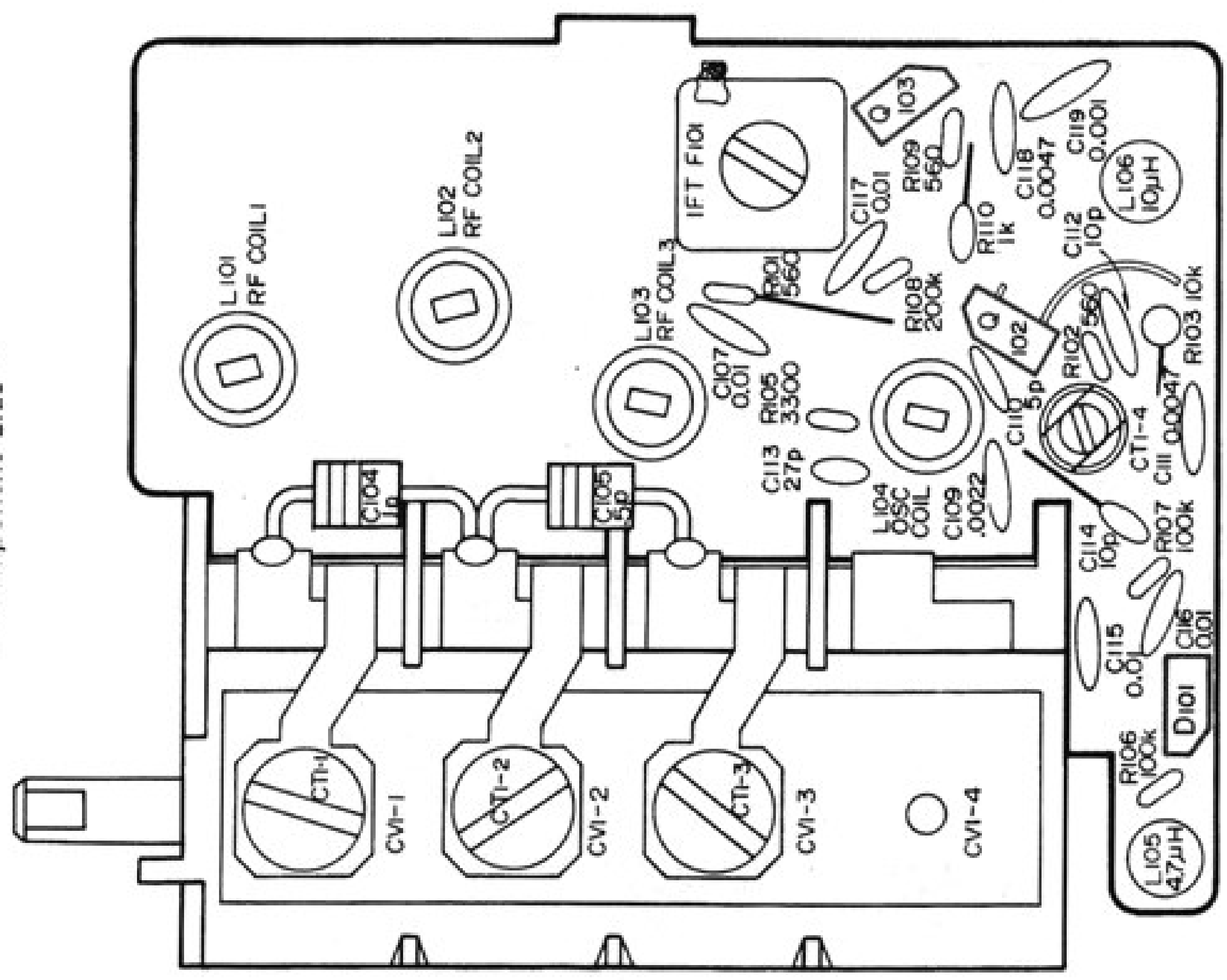
– Conductor Side –

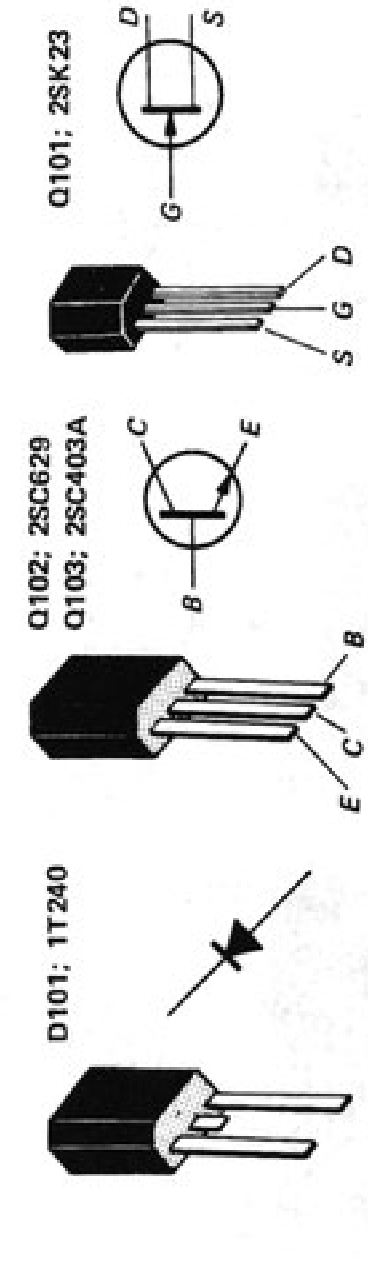


Note: 1. The following parts are mounted on the conductor side: C101, C102, C103, C108, C120, C121, C122, R104 and Q101.

2. Printed circuit board: Part No. 1-538-793-12

– Component Side –





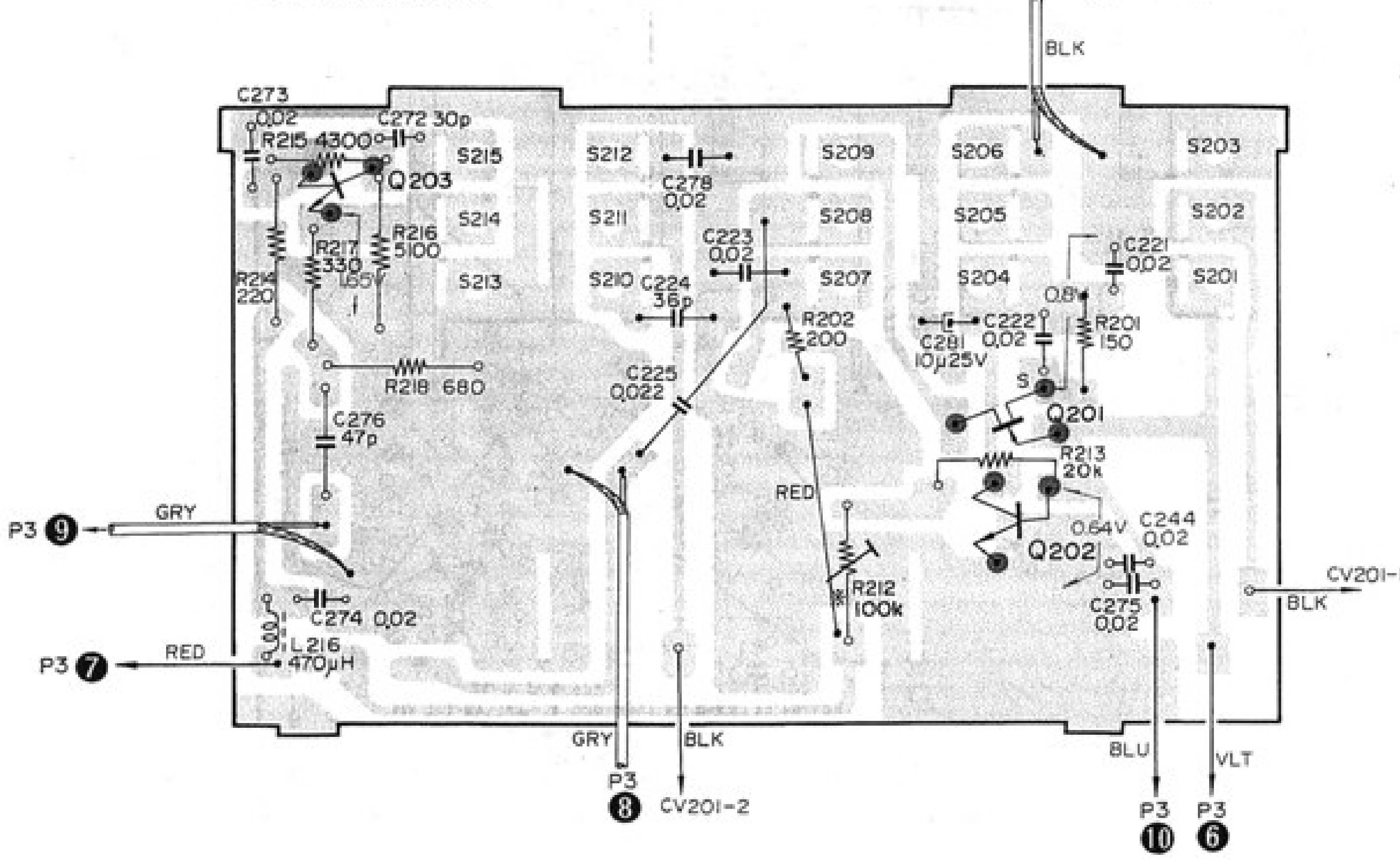
D101; 1T240

Q102; 2SC629
Q103; 2SC403A

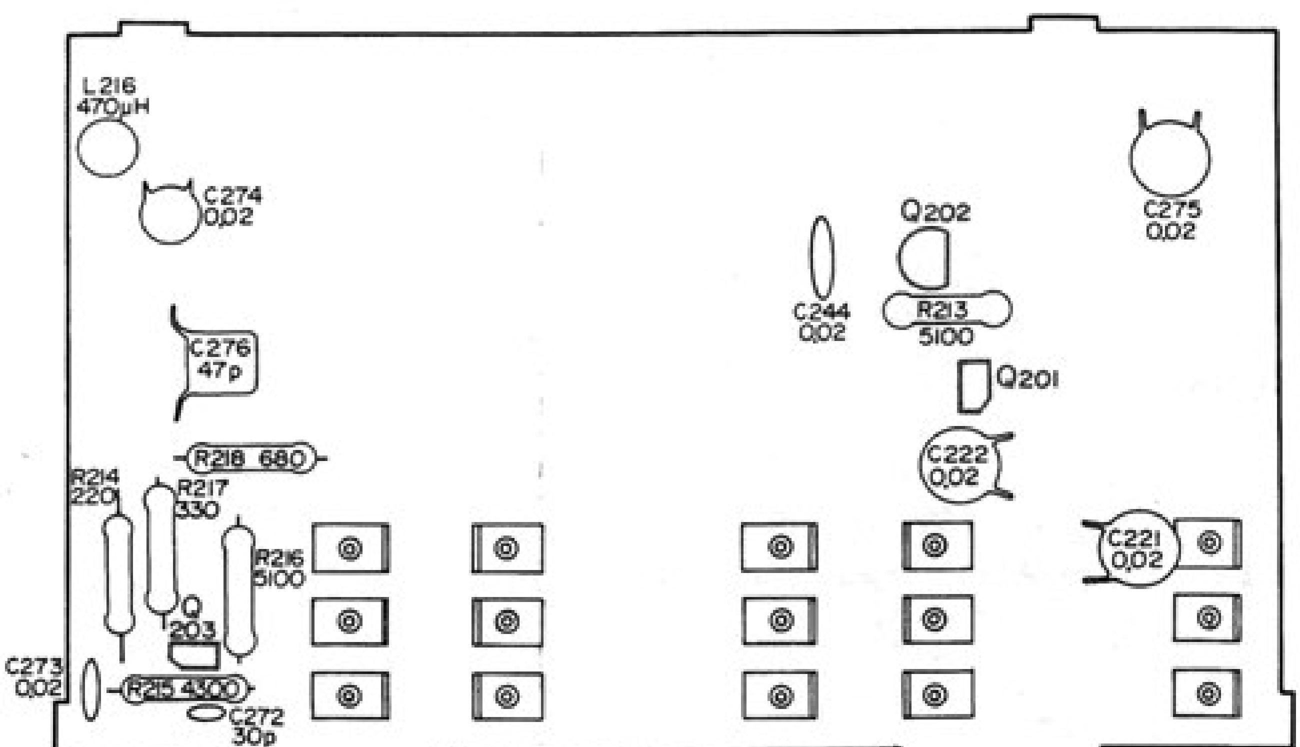
Q101; 2SK23

4-3. SW2–SW10 FRONT END (p2)

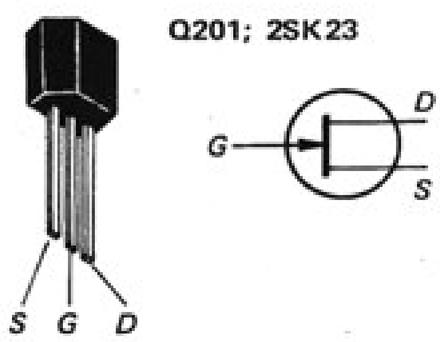
– *Conductor Side* –



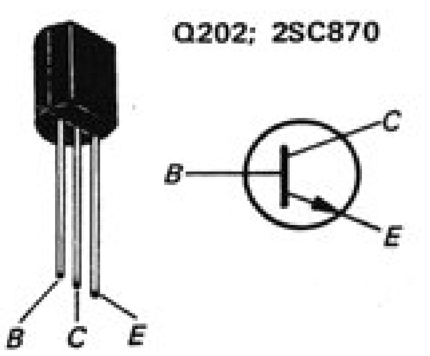
– *Component Side* –



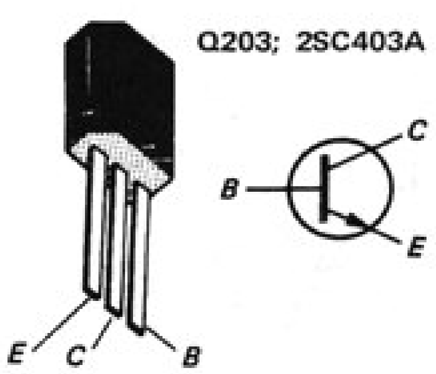
Q201; 2SK23



Q202; 2SC870



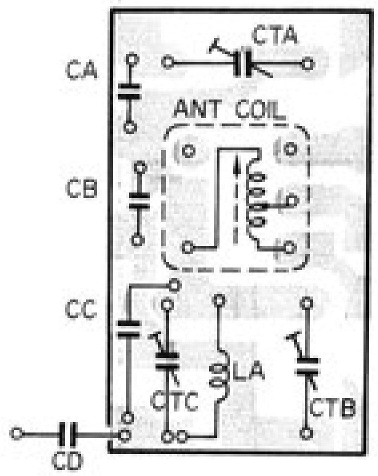
Q203; 2SC403A



Note:

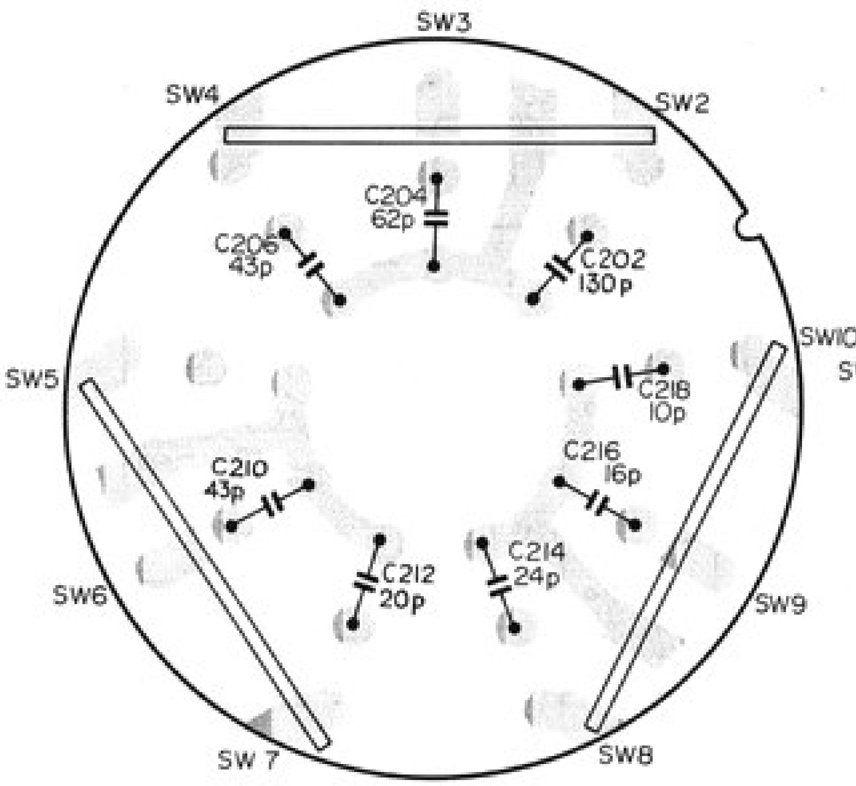
1. The following parts are mounted on the conductor side; R201, R202, C223, C224, C225, C278, C281, Q201, Q202, Q203 and R212.
2. Printed circuit board; Part No. 1-539-244-11

C202, C204, C206, C210, C212
C214, C216, C218;
mounted on the conductor side.

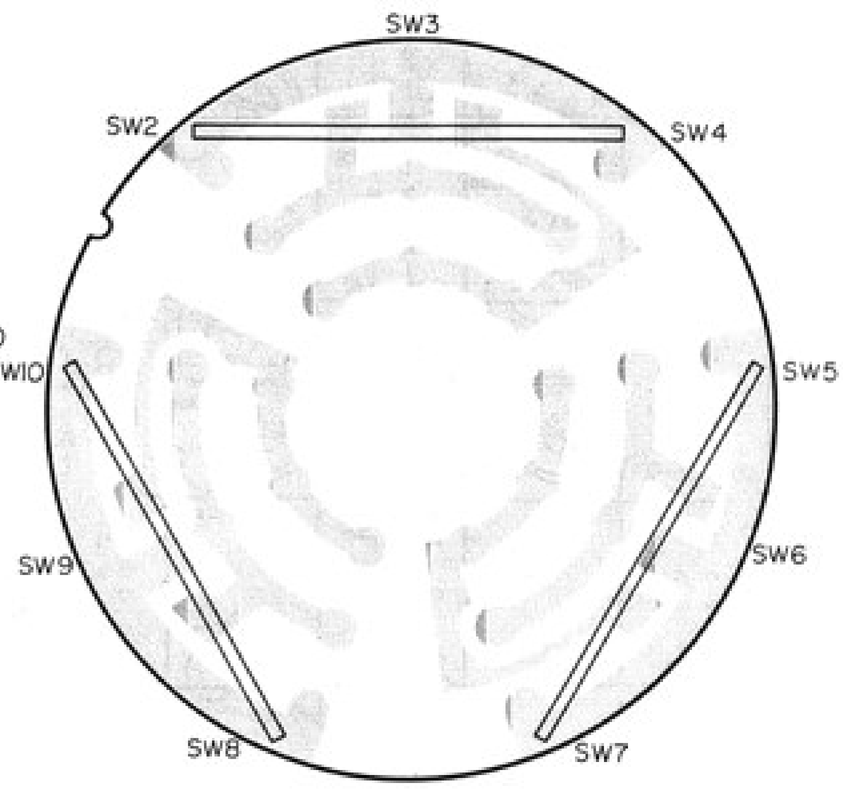


Ⓕ

Ⓐ

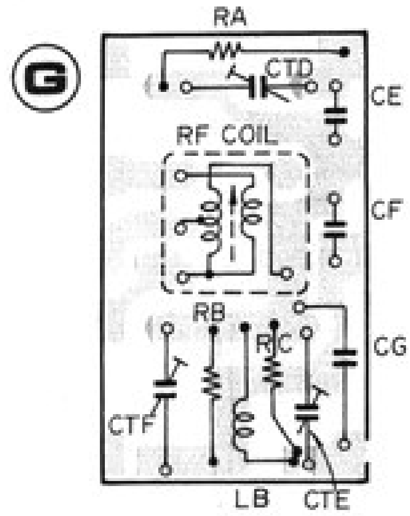


Ⓑ

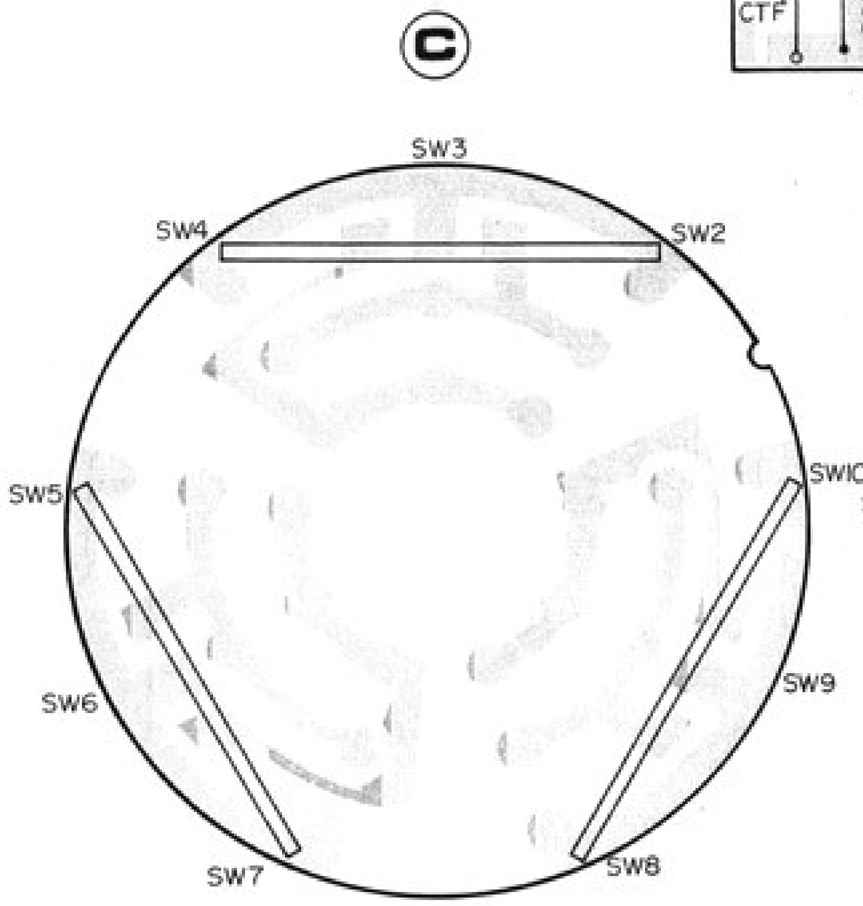


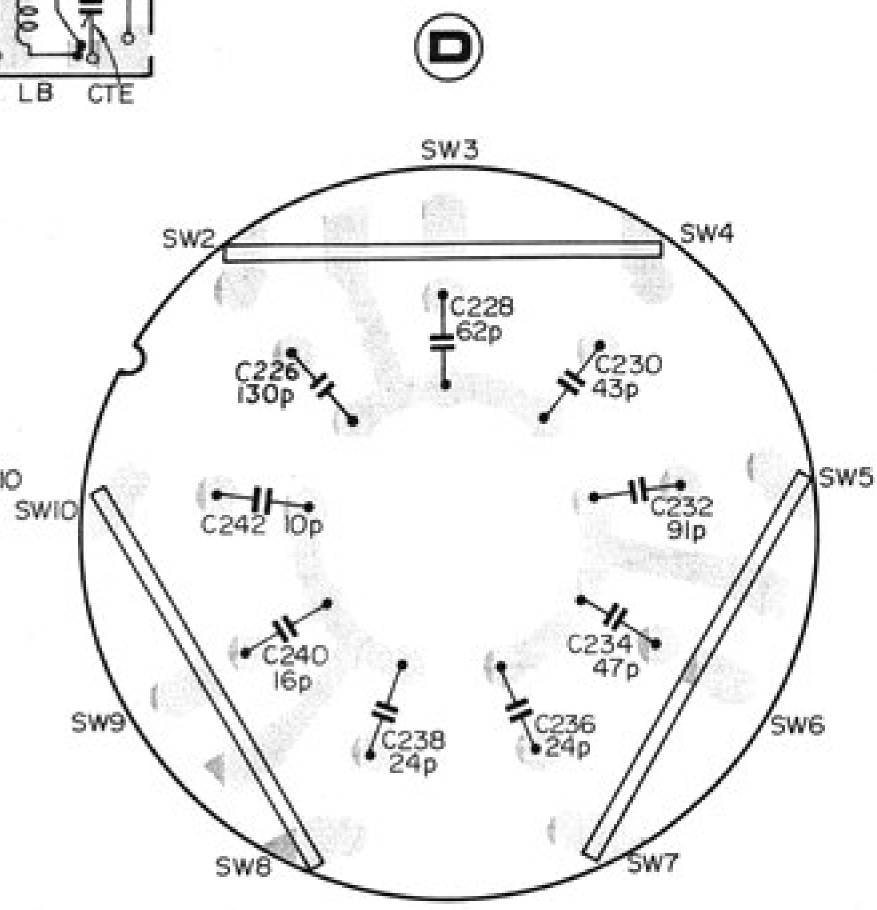
Parts Description on Circuit Board Ⓕ

BAND	ANT COIL	CAPACITOR CA	CAPACITOR CB	CAPACITOR CC	TRIMMER CAPACITOR CTA	TRIMMER CAPACITOR CTB	TRIMMER CAPACITOR CTC	CD	LA
SW2 ~ SW4	L201	C203	C205		CT201	CT202	CT203	C277	L217
		62pF	20pF					0.02μH	18μH
SW5 ~ SW7	L202	C209	C211	C213	CT204	CT205	CT206		
		130 pF	56 pF	10 pF					
SW8 ~ SW10	L203	C215	C217	C219	CT207	CT208	CT209		
		68 pF	24 pF	0.5 ~10 pF					



C226, C228, C230, C232, C234, C236, C238, C240, C242; mounted on the conductor side.



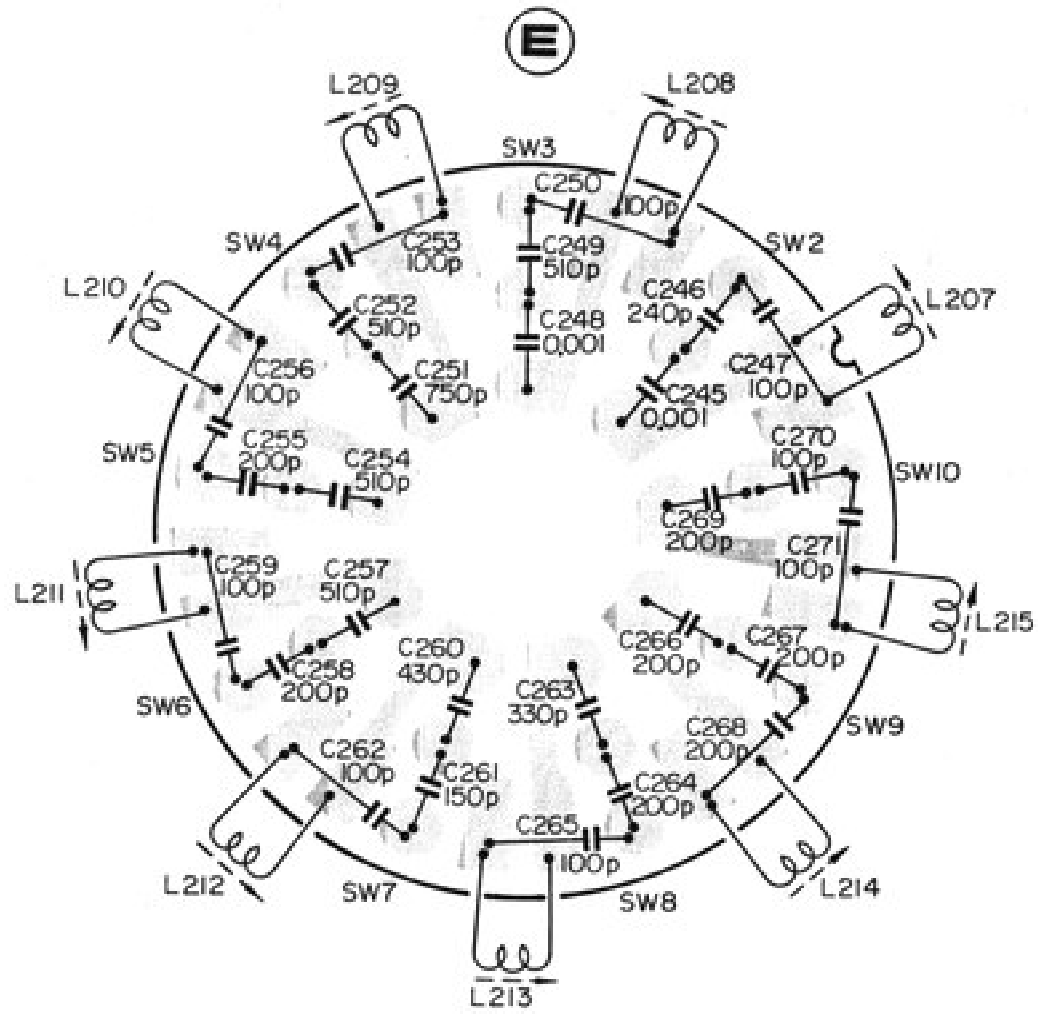


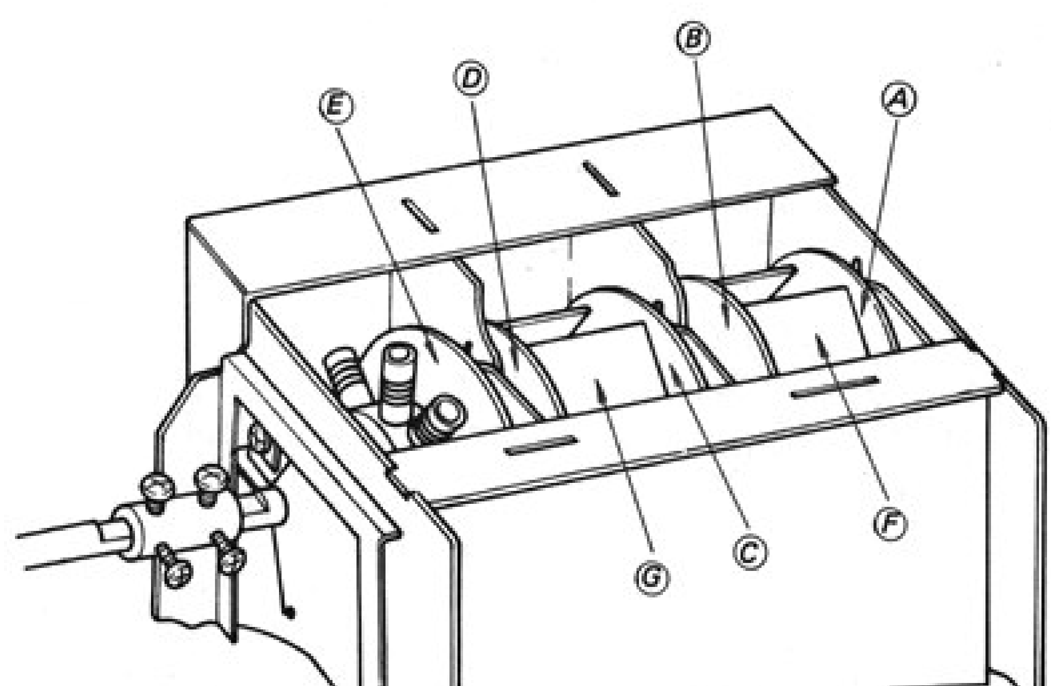
Parts Description on Circuit Board Ⓖ

BAND	RF COIL	CAPACITOR			RESISTOR			TRIMMER CAPACITOR			
		CE	CF	CG	RA	RB	RC	CTD	CTE	CTF	LB
SW2–SW4	L204	C227	C229	C231	R203	R204	R205	CT 210	CT 211	CT 212	L218
		62pF	20pF	47pF	3k	2k	1,500				18μH
SW5–SW7	L205	C233	C235	C237	R206	R207	R208	CT 213	CT 214	CT 215	
		120pF	62pF	10pF	4,300	1,800	820				
SW8–SW10	L206	C239	C241	C243	R209	R210	R211	CT 216	CT 217	CT 218	
		68pF	24pF	0.5–10pF	680	510	390				

RA, RB, RC, LB; mounted on the conductor side.

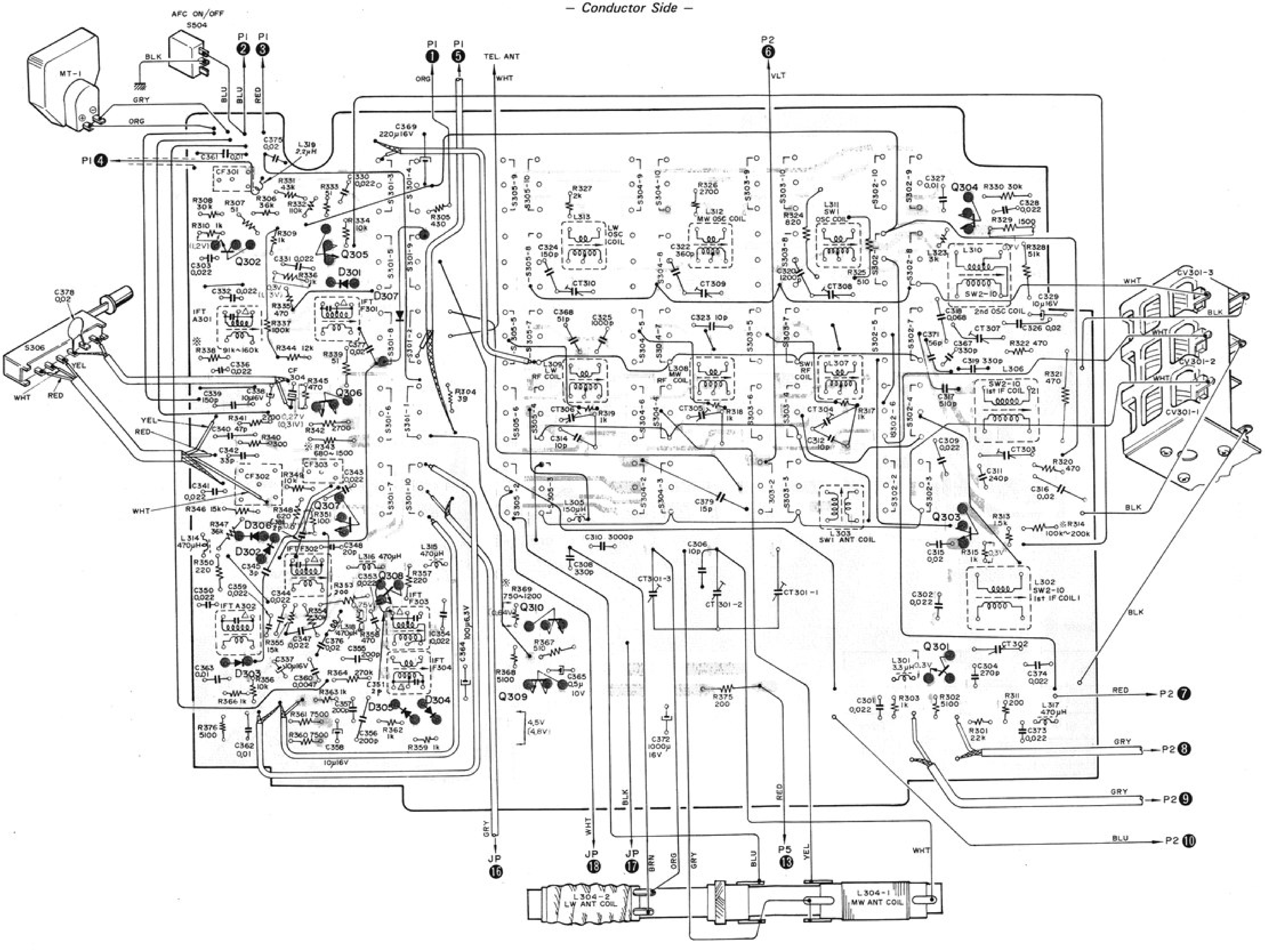
C245 – C271, L207 – L215;
mounted on the conductor side.



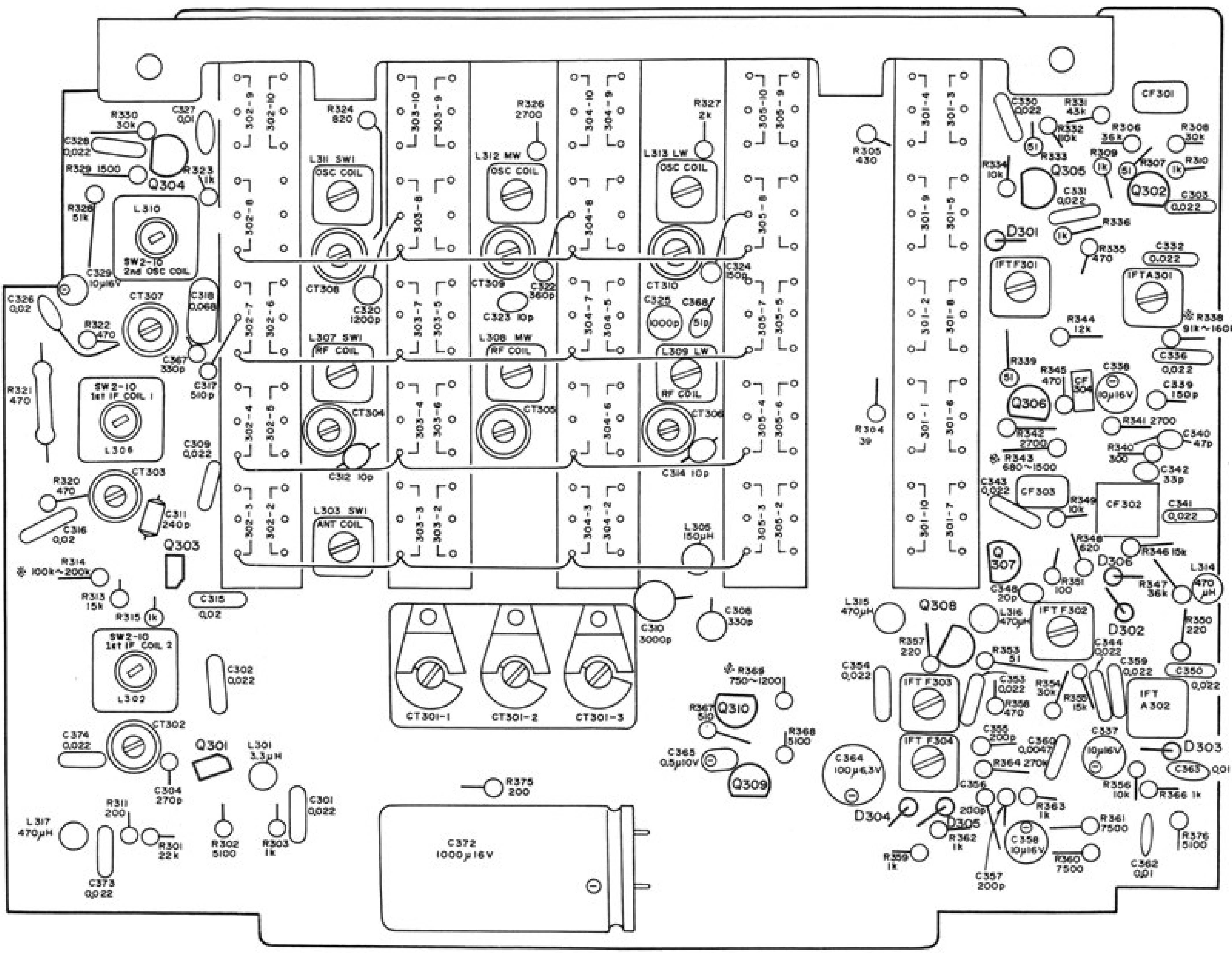


4-4. CP/IF CIRCUIT BOARD (P3)

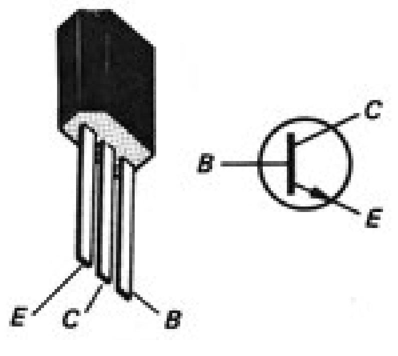
– Conductor Side –



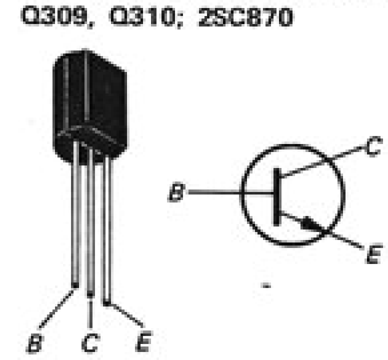
– Component Side –



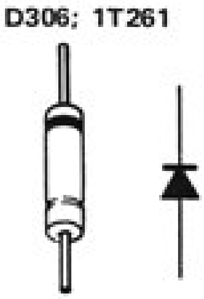
Q301, Q303; 2SC403A



Q302, Q304–Q308; 2SC710
Q309, Q310; 2SC870



D301, D302, D304,
D305; 1T262
D303; 1T23
D306; 1T261

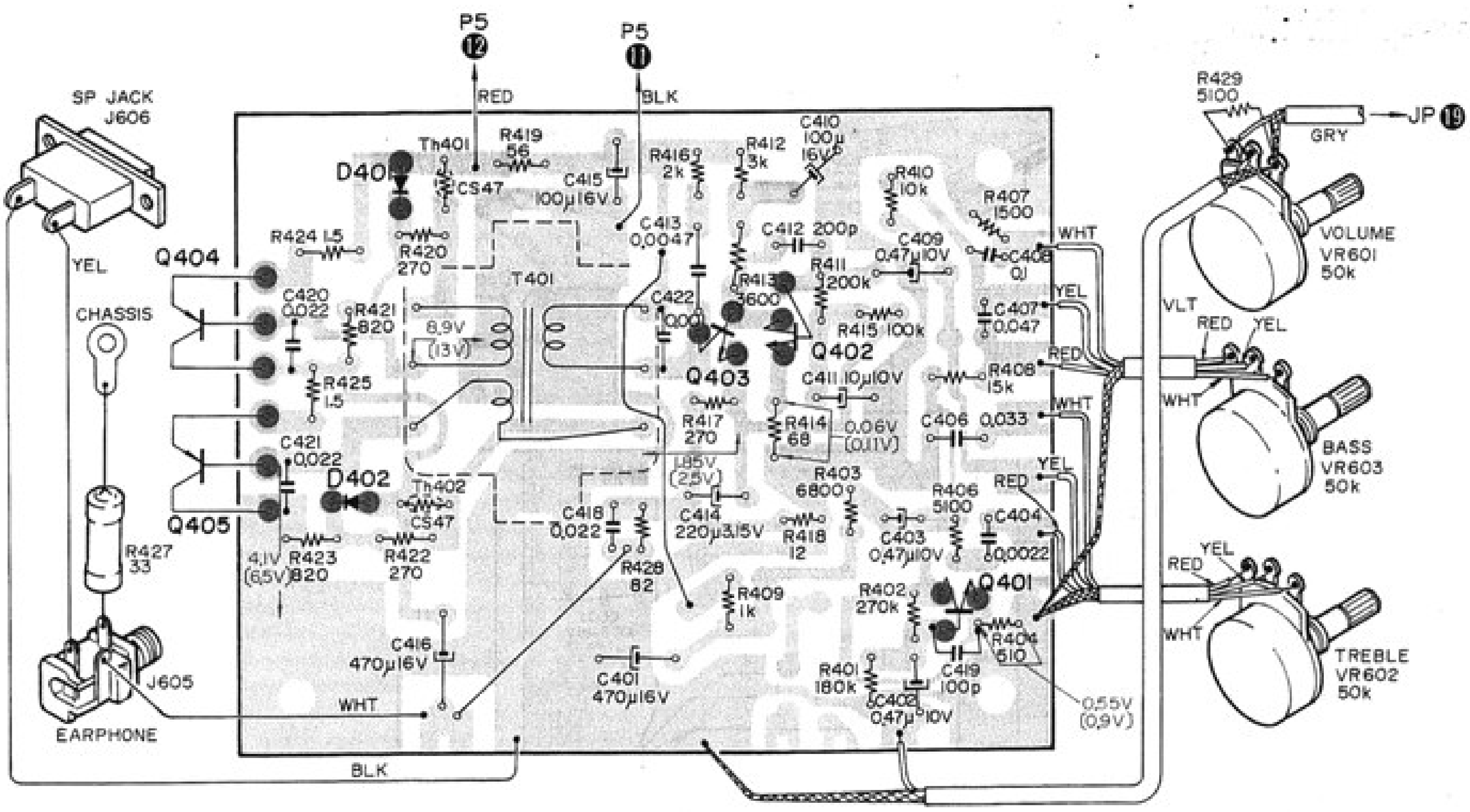


Note:

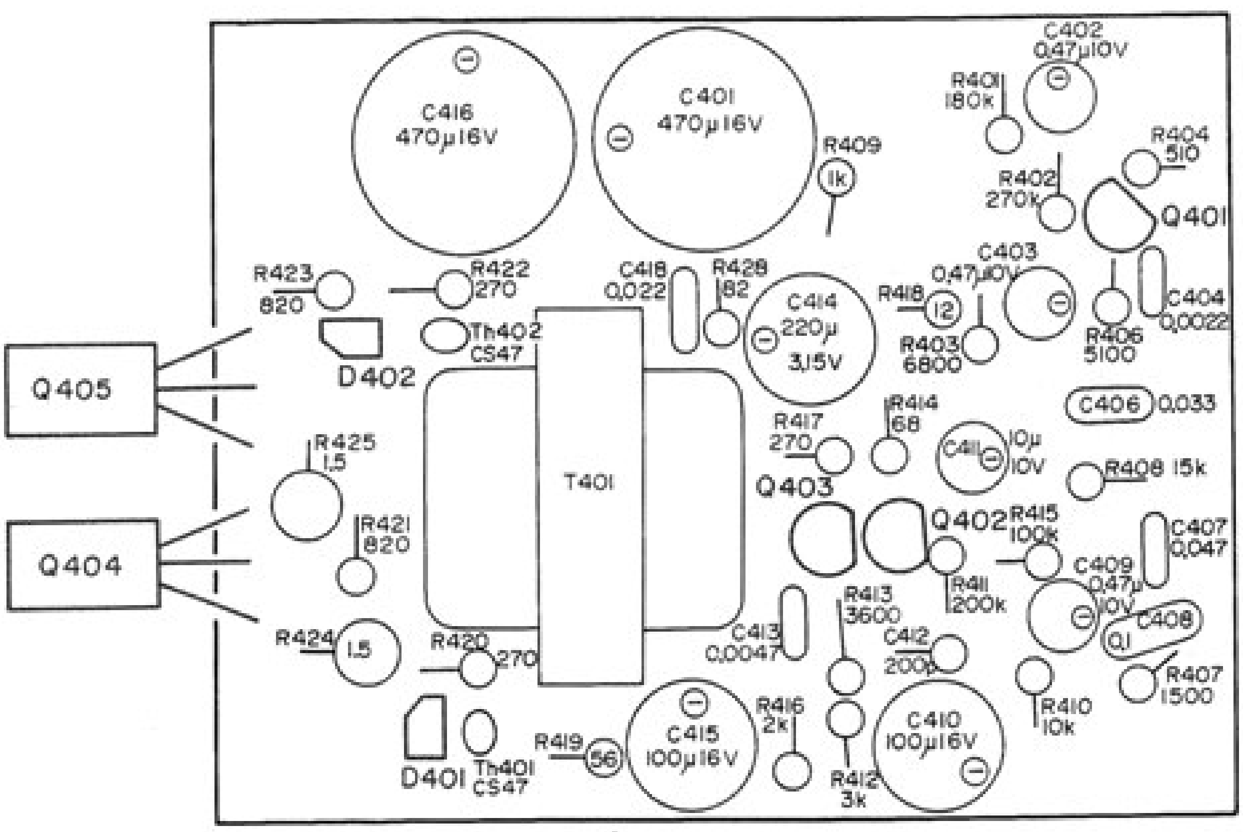
1. The following parts are mounted on the conductor side; R317, R318, R319, R325, R337, C306, C319, C345, C347, C361, C369, C371, C376, C377, C379, L318, D307.
2. Printed circuit board; Part No. 1-539-252-12

4-5. AF CIRCUIT BOARD

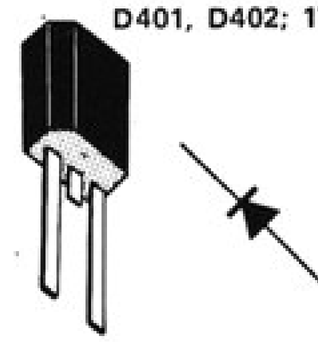
– Conductor Side –



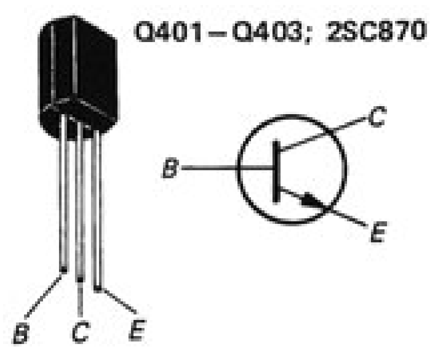
– Component Side –



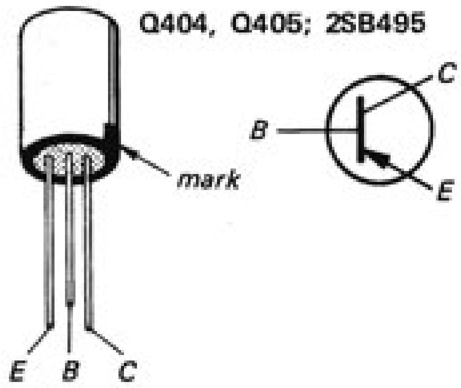
D401, D402; 1T243



Q401–Q403; 2SC870



Q404, Q405; 2SB495

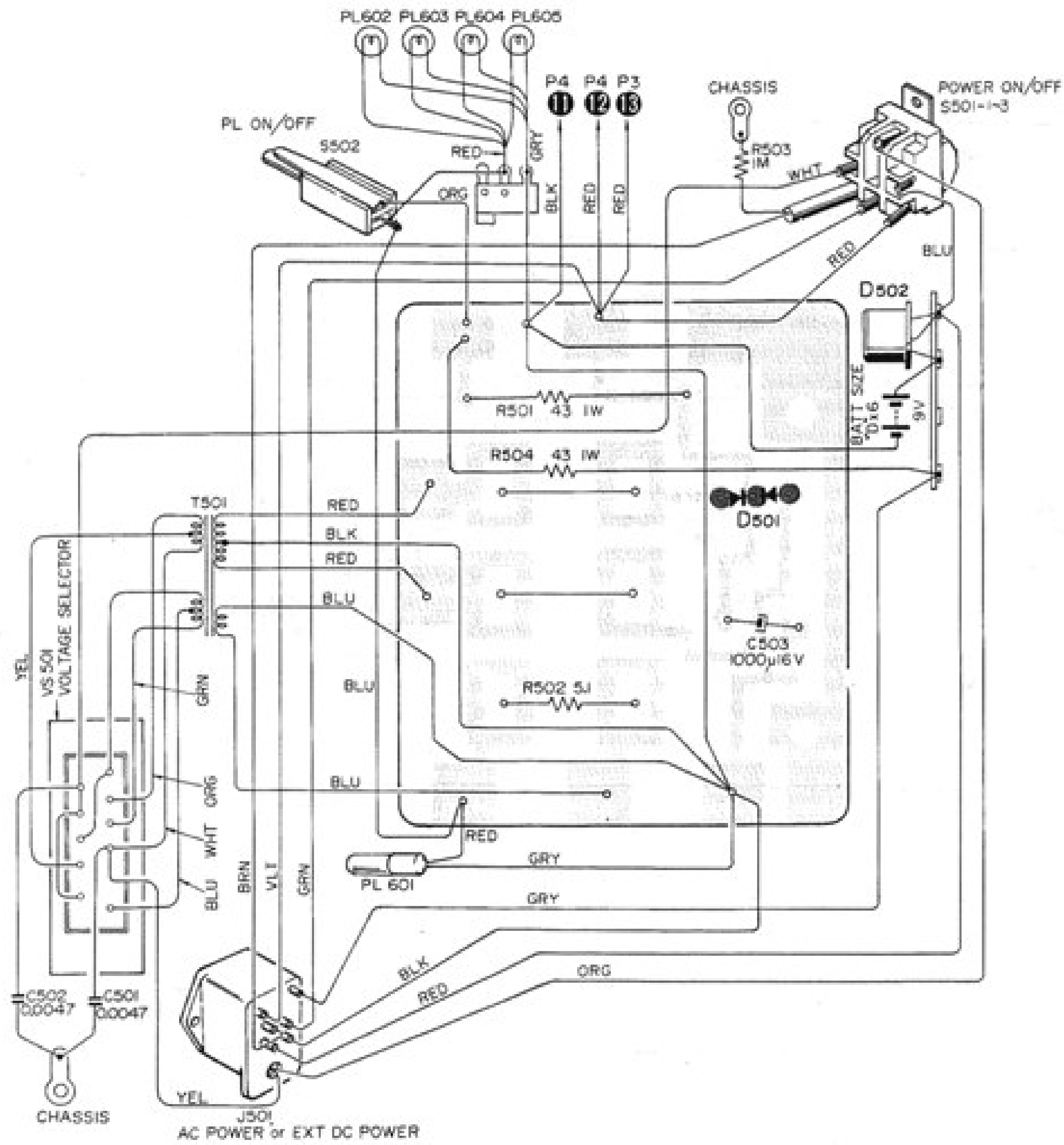


Note:

1. The following parts are mounted on the conductor side; C419, C420, C421, C422.
2. Printed circuit board; Part No. 1-539-253-11

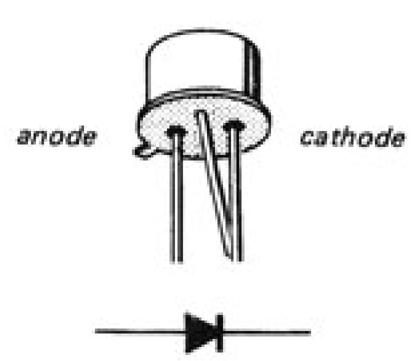
4-6. POWER SUPPLY CIRCUIT BOARD

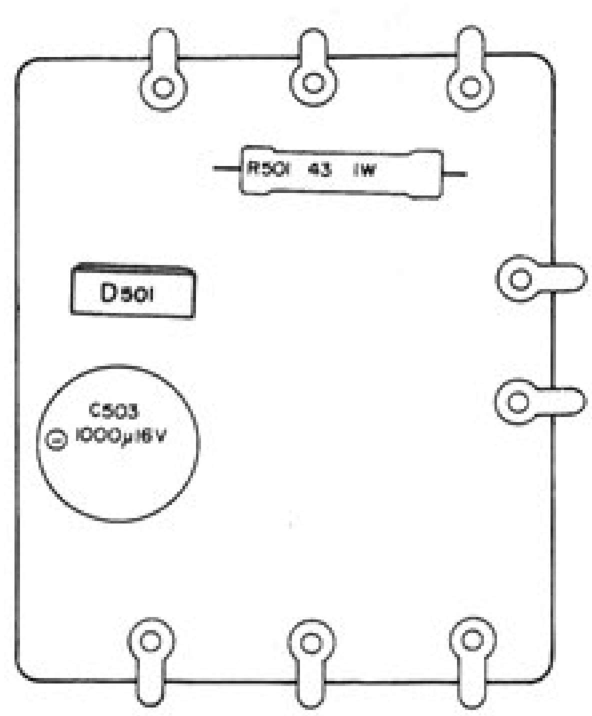
— Conductor Side —



— Component Side —

D502; 1T378

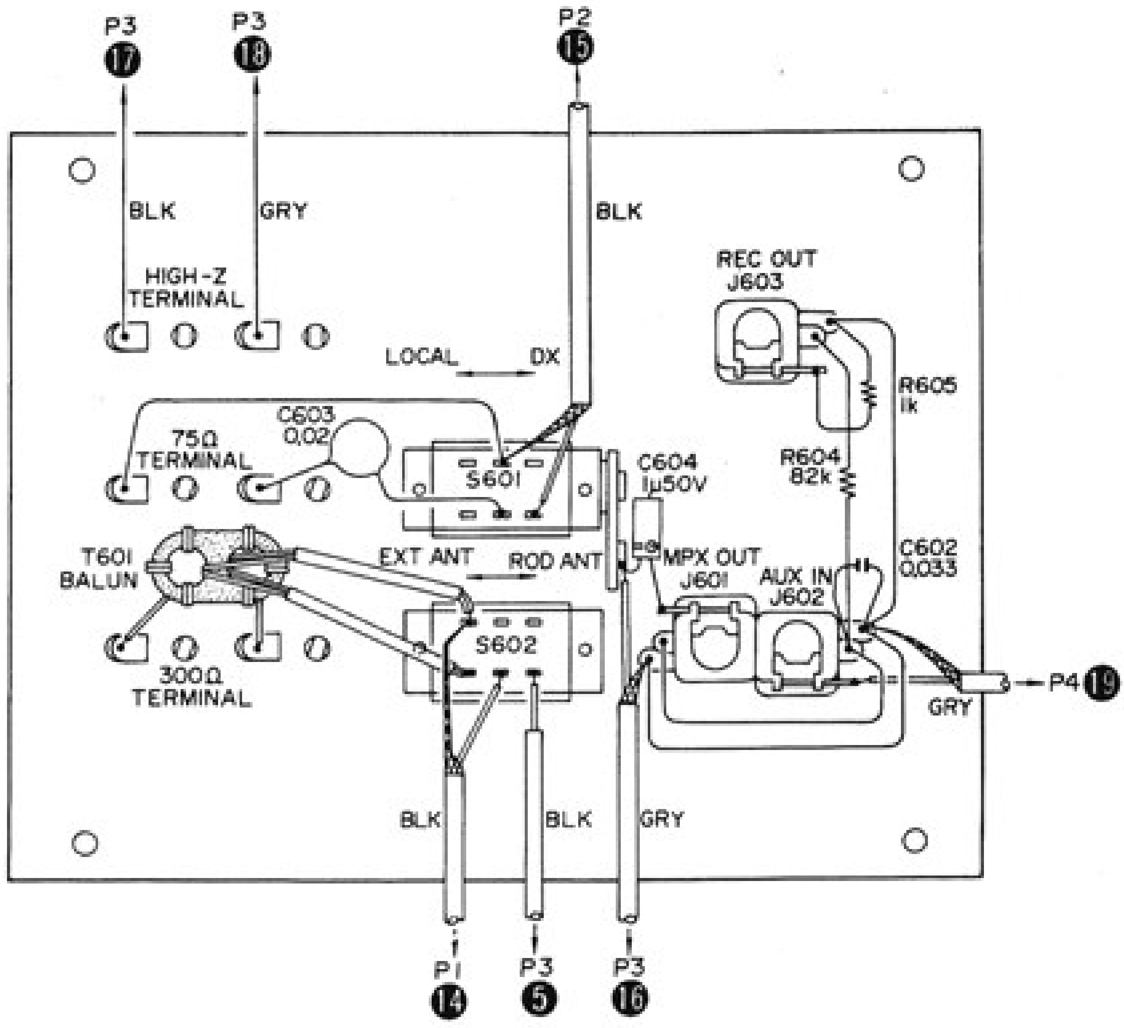




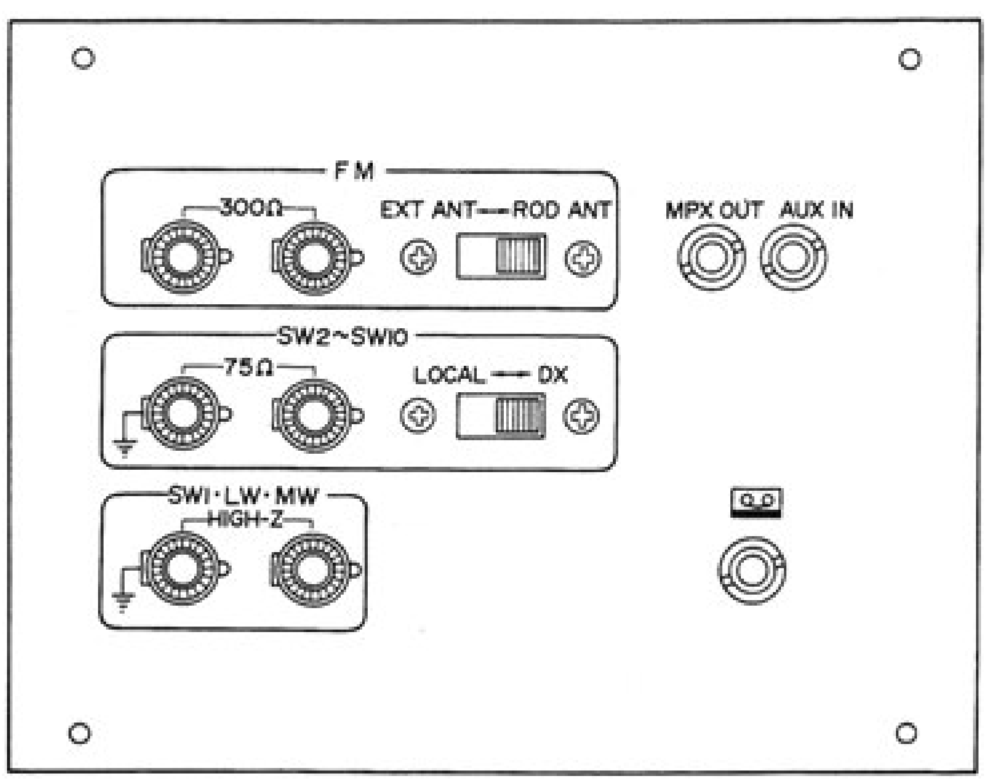
Printed circuit board
Part No. 1-539-254-11

4-7. JACK PANEL

– Conductor Side –

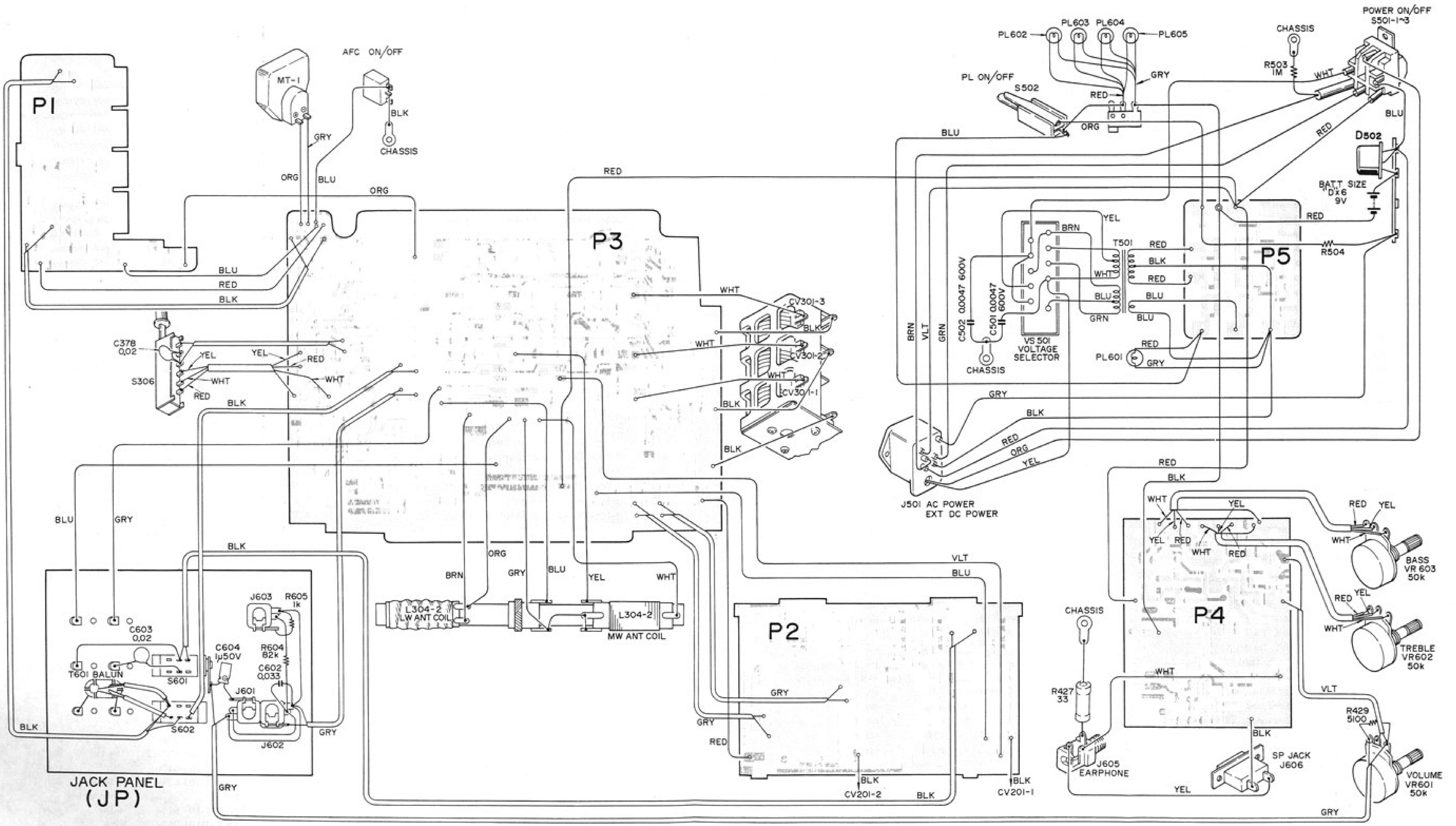


– Component Side –



MEMO

4-8. WIRING DIAGRAM



SECTION 5
ELECTRICAL PARTS LIST

SEMICONDUCTORS

Ref. No.	Part No.	Description	
Q101		transistor (FET)	2SK23
Q102		transistor	2SC629
Q103		transistor	2SC403A
Q201		transistor (FET)	2SK23
Q202		transistor	2SC870
Q203		transistor	2SC403A
Q301		transistor	2SC403A
Q302	1-801-003-	transistor	2SC710
Q303		transistor	2SC403A
Q304	1-801-003-	transistor	2SC710
Q305	1-801-003-	transistor	2SC710
Q306	1-801-003-	transistor	2SC710
Q307	1-801-003-	transistor	2SC710
Q308	1-801-003-	transistor	2SC710
Q309	1-801-004-	transistor	2SC870
Q301	1-801-004-	transistor	2SC870
Q401	1-801-004-	transistor	2SC870
Q402	1-801-004-	transistor	2SC870
Q403	1-801-004-	transistor	2SC870
Q404	1-801-005-	transistor	2SB495
Q405	1-801-005-	transistor	2SB495
D101		diode	1T240
D301		diode	1T262
D302		diode	1T262
D303		diode	1T23
D304		diode	1T262
D305		diode	1T262
D306		diode	1T261
D307		diode	1S1555
D401		diode	1T243
D402		diode	1T243
D501		diode	CD-2
D502		diode	1T378
Th401	1-691-002-01	thermistor	CS-47
Th402	1-691-002-01	thermistor	CS-47

COILS AND TRANSFORMERS

Ceramic filters marked ※ are selected to yield specified operating condition. When replacing it, use a ceramic filter as same colored as the used one.

Ref. No.	Part No.	Description
L101	1-425-526-	rf coil, fm 1
L102	1-425-525-	rf coil, fm 2
L103	1-425-525-	rf coil, fm 3
L104	1-425-386-	osc coil, fm
L105	1-407-186-	micro inductor, 4.7μH
L106	1-407-190-	micro inductor, 10μH
L201	1-401-405-	antenna coil, SW2 – SW4
L202	1-401-406-	antenna coil, SW5 – SW7
L203	1-401-407-	antenna, coil, SW8 – SW10
L204	1-425-579-	rf coil, SW2 – SW4
L205	1-424-580-	rf coil, SW5 – SW7
L206	1-405-581-	rf coil, SW8 – SW10
L207	1-405-419-	1st osc coil, SW2
L208	1-405-420-	1st osc coil, SW3
L209	1-405-421-	1st osc coil, SW4
L210	1-405-422-	1st osc coil, SW5
L211	1-405-423-	1st osc coil, SW6
L212	1-405-424-	1st osc coil, SW7
L213	1-405-425-	1st osc coil, SW8
L214	1-405-426-	1st osc coil, SW9
L215	1-405-427-	1st osc coil, SW10
L216	1-407-177-	micro inductor 470μH
L217	1-407-160-	micro inductor 18μH
L218	1-407-160-	micro inductor 18μH
L301	1-407-184-	micro inductor 3.3μH
L302	1-425-442-	coil, SW2 – SW10 1st i-f
L303	1-401-408-	antenna coil, SW1
L304	1-401-348-23	antenna coil, mw/lw ferrite bar
L305	1-407-171-	micro inductor 150μH
L306	1-425-442-	coil, SW2 – SW10 1st i-f
L307	1-425-577-	rf coil, SW1
L308	1-425-578-	rf coil, mw
L309	1-425-582-	rf coil, lw
L310	1-425-576-	2nd osc coil, SW2 – SW10
L311	1-405-408-	osc coil, SW1
L312	1-405-409-	osc coil, mw
L313	1-405-410-	osc coil, lw
L314	1-407-177-	micro inductor, 470μH
L315	1-407-177-	micro inductoe, 470μH
L316	1-407-177-	micro inductor, 470μH
L317	1-407-177-	micro inductor, 470μH
L318	1-407-177-	micro inductor, 470μH
L319	1-407-182-	micro inductor, 2.2μH
IFT F101	1-403-294-	transformer, fm i-f
IFT F301	1-403-244-15	transformer, fm i-f
IFT F302	1-403-244-15	transformer, fm i-f
IFT F303	1-403-272-15	discriminator, fm i-f
IFT F304	1-403-288-11	discriminator, fm i-f
IFT A301	1-403-026-211	transformer, a-m i-f
IFT A302	1-403-137-11	transformer, a-m i-f
※CF301 ※CF303	1-527-501-11	ceramic filter, fm 10.70 MHz (RED)
	1-527-501-12	ceramic filter, fm 10.67 MHz (BLU)
	1-527-501-13	ceramic filter, fm 10.73 MHz (ORG)
	1-527-501-14	ceramic filter, fm 10.64 MHz (BLK)
	1-527-501-15	ceramic filter, fm 10.76 MHz (WHT)
CF302	1-403-161-13	ceramic filter, a-m
CF304	1-403-154-11	ceramic filter, a-m
T401	1-423-140-	transformer, input
T501	1-441-536-	transformer, power
T601	1-441-023-	balun

CAPACITORS

Capcaitors marked ★ are added for the unit that the best tracking point is out of the adjustable range.

Ref. No.	Part No.	Description	
C101	1-101-861-	15 pF	ceramic
C102	1-101-861-	15 pF	ceramic
C103	1-101-956-	6 pF	ceramic
C104	1-101-937-	1 pF	ceramic
C105	1-101-936-	0.5 pF	ceramic
C106		– discarded –	
C107	1-101-864-	0.01μF	ceramic
C108	1-102-662-	7 pF	ceramic
C109	1-102-089-	0.0022μF	ceramic
C110	1-102-864-	5 pF	ceramic
C111	1-102-090-	0.0047μF	ceramic
C112	1-102-508-	10 pF	ceramic

Ref. No.	Part No.	Description	
C113	1-101-869-	27pF	ceramic
C114	1-101-976-	10pF	ceramic
C115	1-101-072-	0.01μF	ceramic
C116	1-101-072-	0.01μF	ceramic
C117	1-101-072-	0.01μF	ceramic
C118	1-105-829-12	0.0047μF	mylar
C119	1-101-918-	0.001μF	ceramic
C120	1-101-072-	0.01μF	ceramic
C121	1-101-958-	8pF	ceramic
C122	1-101-958-	8 pF	ceramic
C201		– discarded –	
C202	1-107-088-	130pF	silvered mica
C203	1-107-080-	62pF	silvered mica
C204	1-107-080-	62pF	silvered mica
C205	1-107-068-	20pF	silvered mica
C206	1-107-076-	43pF	silvered mica
C207		– discarded –	
C208	1-107-084-	– discarded –	
C209	1-107-088-	130pF	silvered mica
C210	1-107-076-	43 pF	silvered mica
C211	1-107-079-	56 pF	silvered mica
C212	1-107-068-	20 pF	silvered mica
C213	1-107-061-	10pF	silvered mica
C214	1-107-070-	24pF	silvered mica
C215	1-107-081-	68pF	silvered mica
C216	1-107-066-	16pF	silvered mica
C217	1-107-070-	24pF	silvered mica
C218	1-107-061-	10pF	silvered mica
★ C219		0.5pF–10pF	silvered mica
C220		– discarded –	
C221	1-101-924-	0.02μF	ceramic
C222	1-101-924-	0.02μF	ceramic
C223	1-101-924-	0.02μF	ceramic
C224	1-102-964-	36pF	ceramic
C225	1-105-837-12	0.022μF	mylar
C226	1-107-088-	130pF	silvered mica
C227	1-107-080-	62pF	silvered mica
C228	1-107-080-	62pF	silvered mica
C229	1-107-068-	20pF	silvered mica
C230	1-107-076-	43pF	silvered mica
C231	1-107-077-	47pF	silvered mcia
C232	1-107-084-	91pF	silvered mica
C233	1-107-087-	120pF	silvered mica
C234	1-107-077-	47pF	silvered mica
C235	1-107-080-	62pF	silvered mica
C236	1-107-070-	24pF	silvered mica
C237	1-107-061-	10pF	silvered mica
C238	1-107-070-	24pF	silvered mica
C239	1-107-081-	68pF	silvered mica
C240	1-107-066-	16pF	silvered mica
C241	1-107-070-	24pF	silvered mica
C242	1-107-061-	10pF	silvered mica
★ C243		0.5pF–10pF	silvered mica
C244	1-101-924-	0.02μF	ceramic
C245	1-105-661-12	0.001μF	mylar
C246	1-103-610-	240pF	polystyrene
C247	1-103-601-	100pF	polystyrene
C248	1-103-661-12	0.001μF	mylar

Ref. No.	Part No.	Description	
C249	1-103-618-	510pF	polystyrene
C250	1-103-601-	100pF	polystyrene
C251	1-103-622-	750pF	polystyrene
C252	1-103-618-	510pF	polystyrene
C253	1-103-601-	100pF	polystyrene
C254	1-103-618-	510pF	polystyrene
C255	1-103-608-	200pF	polystyrene
C256	1-103-601-	100pF	polystyrene
C257	1-103-618-	510pF	polystyrene
C258	1-103-608-	200pF	polystyrene
C259	1-103-601-	100pF	polystyrene
C260	1-103-616-	430pF	polystyrene
C261	1-103-605-	150pF	polystyrene
C262	1-103-601-	100pF	polystyrene
C263	1-103-613-	330pF	polystyrene
C264	1-103-608-	200pF	polystyrene
C265	1-103-601-	100pF	polystyrene
C266	1-103-608-	200pF	polystyrene
C267	1-103-608-	200pF	polystyrene
C268	1-103-608-	200pF	polystyrene
C269	1-103-608-	200pF	polystyrene
C270	1-103-601-	100pF	polystyrene
C271	1-103-601-	100pF	polystyrene
C272	1-107-072-	30pF	silvered mica
C273	1-101-924-	0.02μF	ceramic
C274	1-101-924-	0.02μF	ceramic
C275	1-101-924-	0.02μF	ceramic
C276	1-107-077-	47pF	silvered mica
C277	1-101-924-	0.02μF	ceramic
C278	1-101-924-	0.02μF	ceramic
C279	1-107-061-	– discarded –	
C280	1-107-061-	– discarded –	
C281	1-121-398-	10μF 25V	electrolytic
C301	1-105-677-12	0.022μF	mylar
C302	1-105-677-12	0.022μF	mylar
C303	1-105-677-12	0.022μF	mylar
C304	1-103-611-	270pF	polystyrene
C305		– discarded –	
C306	1-101-959-	10pF	ceramic
C307		– discarded –	
C308	1-103-613-	330pF	polystyrene
C309	1-105-677-12	0.022μF	mylar
C310	1-103-636-	3,000pF	polystyrene
C311	1-103-610-	240pF	polystyrene
C312	1-101-959-	10pF	ceramic
C313		– discarded –	
C314	1-101-959-	10pF	ceramic
C315	1-101-924-	0.02μF	ceramic
C316	1-101-924-	0.02μF	ceramic
C317	1-103-618-	510pF	polystyrene
C318	1-105-683-12	0.068μF	mylar
C319	1-103-613-	330pF	polystyrene
C320	1-103-627-	1,200pF	polystyrene
C321		– discarded –	
C322	1-103-614-	360pF	polystyrene
C323	1-101-959-	10pF	ceramic
C324	1-103-605-	150pF	polystyrene
C325	1-103-625-	1,000pF	polystyrene

Ref. No.	Part No.	Description		
C326	1-105-677-12	0.022μF		mylar
C327	1-105-673-12	0.01μF		mylar
C328	1-105-677-12	0.022μF		mylar
C329	1-121-347-	10μF	16V	electrolytic
C330	1-105-677-12	0.022μF		mylar
C331	1-105-677-12	0.022μF		mylar
C332	1-105-677-12	0.022μF		mylar
C333		– discarded –		
C334		– discarded –		
C335		– discarded –		
C336	1-105-677-12	0.022μF		mylar
C337	1-121-347-	10μF	16V	electrolytic
C338	1-121-347-	10μF	16V	electrolytic
C339	1-103-605-	150pF		polystyrene
C340	1-101-880-	47pF		ceramic
C341	1-105-677-12	0.022μF		mylar
C342	1-101-872-	33pF		ceramic
C343	1-105-677-12	0.022μF		mylar
C344	1-105-677-12	0.022μF		mylar
C345	1-101-187-	3pF		ceramic
C346		– discarded –		
C347	1-105-677-12	0.022μF		mylar
C348	1-101-864-	20pF		ceramic
C349		– discarded –		
C350	1-105-677-12	0.022μF		mylar
C351	1-101-177-	2pF		ceramic
C352		– discarded –		
C353	1-105-677-12	0.022μF		mylar
C354	1-105-677-12	0.022μF		mylar
C355	1-103-608-	200pF		polystyrene
C356	1-103-608-	200pF		polystyrene
C357	1-103-608-	200pF		polystyrene
C358	1-121-347-	10μF	16V	electrolytic
C359	1-105-677-12	0.022μF		mylar
C360	1-105-681-12	0.0047μF		mylar
C361	1-105-673-12	0.01μF		mylar
C362	1-105-673-12	0.01μF		mylar
C363	1-105-673-12	0.01μF		mylar
C364	1-121-291-	100μF	6.3V	electrolytic
C365	1-127-022-	0.5μF	10V	elecrtolytic (alox)
C366		– discarrded –		
C367	1-103-613-	330pF		polystyrene
C368	1-101-882-	51pF		ceramic
C369	1-121-420-	220μF	16V	electrolytic
C370		– discarded –		
C371	1-101-884-	56pF		ceramic
C372	1-121-186-	1,000μF	16V	electrolytic
C373	1-105-677-12	0.022μF		mylar
C374	1-105-677-12	0.022μF		mylar
C375	1-101-924-	0.02μF		ceramic
C376	1-101-924-	0.02μF		ceramic
C377	1-101-924-	0.02μF		ceramic
C378	1-101-924-	0.02μF		ceramic
C379	1-101-861-	15pF		ceramic
C380	1-101-177-	2pF		ceramic
C401	1-121-426-	470μF		electrolytic
C402	1-121-726-	0.47μF	10V	electrolytic
C403	1-121-726-	0.47μF	10V	electrolytic
C404	1-105-665-12	0.0022μF		mylar

Ref. No.	Part No.	Description		
C405		– discarded –		
C406	1-105-679-12	0.033μF		mylar
C407	1-105-681-12	0.047μF		mylar
C408	1-105-685-12	0.1μF		mylar
C409	1-121-725-	0.47μF	10V	electrolytic
C410	1-121-356-	100μF	16V	electrolytic
C411	1-121-347-	10μF	10V	electrolytic
C412	1-103-608-	200pF		polystyrene
C413	1-105-669-12	0.0047μF		mylar
C414	1-121-294	220μF	3.15V	electrolytic
C415	1-121-356-	100μF	16V	electrolytic
C416	1-121-426-	470μF	16V	electrolytic
C417		– discarded –		
C418	1-108-243-	0.022μF		mylar
C419	1-103-601-	100pF		polystyrene
C420	1-105-717-12	0.022μF		mylar
C421	1-105-717-12	0.022μF		mylar
C422	1-105-661-12	0.001μF		mylar
C501	1-115-071-	0.0047μF	600V	paper
C502	1-115-071-	0.0047μF	600V	paper
C503	1-121-186-	1,000μF	16V	electrolytic
C601		– discarded –		
C602	1-105-679-12	0.022μF		mylar
C603	1-101-924-	0.02μF		ceramic
C604	1-121-391-	1μF	50V	electrolytic
CV1-1~ CV1-4	1-151-158-12	capacitor, fm tuning, 4 gang		
CV201-1 CV202-2	1-151-167-21	capacitor, sw tuning, 2 gang		
CV301-1 CV301-2 CV303-1	1-151-182-13S	capacitor, lw/mw/sw1 tuning, 3 gang		
CT1-1 CT1-4	1-141-022-	capacitor, fm trimmer 4 gang		
CT201	1-141-078-	capacitor, sw trimmer (16pF)		
CT202	1-141-078-	capacitor, sw trimmer (16pF)		
CT203	1-141-078-	capacitor, sw trimmer (16pF)		
CT204	1-141-078-	capacitor, sw trimmer (16pF)		
CT205	1-141-078-	capacitor, sw trimmer (16 pF)		
CT206	1-141-078-	capacitor, sw trimmer (16pF)		
CT207	1-141-078-	capacitor, sw trimmer (16pF)		
CT208	1-144-078-	capacitor, sw trimmer (16pF)		
CT209	1-141-078-	capacitor, sw trimmer (16pF)		
CT210	1-141-078-	capacitor, sw trimmer (16pF)		
CT211	1-141-078-	capacitor, sw trimmer (16pF)		
CT212	1-141-078-	capacitor, sw trimmer (16pF)		
CT213	1-141-078-	capacitor, sw trimmer (16pF)		
CT214	1-141-078-	capacitor, sw trimmer (16pF)		
CT215	1-141-078-	capacitor, sw trimmer (16pF)		
CT216	1-141-078-	capacitor, sw trimmer (16pF)		
CT217	1-114-078-	capacitor, sw trimmer (16pF)		
CT218	1-141-078-	capacitor, sw trimmer (16pF)		
CT301-1 CT301-2 CT301-3	1-141-015-12	capacitor, a-m trimmer 3 gang		
CT302	1-141-082-11	capacitor, trimmer (20pF)		
CT303	1-141-082-11	capacitor, trimmer (20pF)		
CT304	1-141-082-11	capacitor, trimmer (20pF)		
CT305	1-141-082-11	capacitor, trimmer (20pF)		

Ref. No.	*Part No.*	*Description*
CT306	1-141-082-11	capacitor, trimmer (20pF)
CT307	1-141-082-11	capacitor, trimmer (20pF)
CT308	1-141-082-11	capacitor, trimmer (20pF)
CT309	1-141-082-11	capacitor, trimmer (20pF)
CT310	1-141-082-11	capacitor, trimmer (20pF)

RESISTORS

1. Resistors listed below are ¼W, 5%, carbon resistors, unless otherwise noted.
2. Resistors marked ※ are selected in value to yield specified operating condition. Refer to the voltage and current adjustment on page 19.

Ref. No.	*Part No.*	*Description*
R101	1-208-027-	560Ω 1/16W ceramic
R102	1-208-027-	560Ω 1/16W ceramic
R103	1-244-697-	10 kΩ
R104	1-244-697-	10 kΩ
R105	1-208-045-	3,300Ω 1/16W ceramic
R106	1-208-145-	100 kΩ 1/16W ceramic
R107	1-208-145-	100 kΩ 1/16W ceramic
R108	1-208-088-	200 kΩ 1/16W ceramic
R109	1-208-027-	560Ω 1/16W ceramic
R110	1-208-033-	1 kΩ 1/16W ceramic
R201	1-244-653-	150Ω
R202	1-244-656-	200Ω
R203	1-244-684-	3 kΩ
R204	1-244-680-	2 kΩ
R205	1-244-677-	1,500Ω
R206	1-244-688-	4,300Ω
R207	1-244-679	1,800Ω
R208	1-244-671	820Ω
R209	1-244-669-	680Ω
R210	1-244-666-	510Ω
R211	1-244-663-	390Ω
※R212	1-221-638-12	100 kΩ adjustable
R213	1-244-704-	20 kΩ
R214	1-244-657-	220Ω
R215	1-244-688-	4,300Ω
R216	1-244-690-	5,100Ω
R217	1-244-661-	330Ω
R218	1-244-669-	680Ω
R301	1-242-705-	22 kΩ
R302	1-242-690-	5,100Ω
R303	1-242-673-	1 kΩ
R304	1-242-639-	39Ω
R305	1-242-664-	430Ω
R306	1-242-710-	36 kΩ
R307	1-242-642-	51Ω
R308	1-242-708-	30 kΩ
R309	1-242-673-	1 kΩ
R310	1-242-673-	1 kΩ
R311	1-242-656-	200Ω
R312		– discarded –
	1-242-697-	10 kΩ
	1-242-699-	12 kΩ
※R313	1-242-701-	15 kΩ
	1-242-703-	18 kΩ
	1-242-704-	20 kΩ
R314	1-242-727-	180 kΩ
R315	1-242-673-	1 kΩ
R316		– discarded –
R317	1-242-673-	1 kΩ
R318	1-242-673-	1 kΩ
R319	1-242-673-	1 kΩ
R320	1-242-665-	470Ω
R321	1-242-665-	470Ω
R322	1-242-665-	470Ω
R323	1-242-684-	3 kΩ
R324	1-242-671-	820Ω
R325	1-242-666-	510Ω
R326	1-242-683-	2,700Ω
R327	1-242-680-	2 kΩ
R328	1-242-714-	51 kΩ
R329	1-242-677-	1,500Ω
R330	1-242-708-	30 kΩ
R331	1-242-712-	43 kΩ
R332	1-242-722-	110 kΩ
R333	1-242-642-	51Ω
R334	1-242-697-	10 kΩ
R335	1-242-665-	470Ω
R336	1-242-673-	1 kΩ
R337	1-242-721-	100 kΩ
	1-242-720-	91 kΩ
	1-242-721-	100 kΩ
	1-242-722-	110 kΩ
※R338	1-242-723-	120 kΩ
	1-242-724-	130 kΩ
	1-242-725-	150 kΩ
	1-242-726-	160 kΩ
R339	1-242-642-	51Ω
R340	1-242-660-	300Ω
R341	1-242-683-	2,700Ω
R342	1-242-683-	2,700Ω
	1-242-672-	910Ω
	1-242-673-	1 kΩ
	1-242-674-	1,100Ω
※R343	1-242-675-	1,200Ω
	1-242-676-	1,300Ω
	1-242-677-	1,500Ω
R344	1-242-679-	12 kΩ
R345	1-142-665-	470Ω
R346	1-242-701-	15 kΩ
R347	1-242-710-	36 kΩ
R348	1-242-668-	620Ω
R349	1-242-697-	10 kΩ
R350	1-242-657-	220Ω
R351	1-242-649-	100Ω
R352		– discarded –
R353	1-244-656	200Ω
R354	1-242-708-	30 kΩ
R355	1-242-701-	15 kΩ
R356	1-242-656-	10 kΩ
R357	1-242-657-	220Ω
R358	1-242-665-	470Ω
R359	1-242-673-	1 kΩ
R360	1-242-694-	7,500Ω

Ref. No.	Part No.	Description		
R361	1-242-694-	7,500Ω		
R362	1-242-673-	1kΩ		
R363	1-242-673-	1kΩ		
R364	1-242-731-	270kΩ		
R365		– discarded –		
R366	1-242-673-	1kΩ		
R367	1-242-666-	510Ω		
R368	1-242-690-	5,100Ω		
※R369	1-242-670-	750Ω		
	1-242-671-	820Ω		
	1-242-672-	910Ω		
	1-242-673-	1kΩ		
	1-242-674-	1,100Ω		
	1-242-675-	1,200Ω		
R370		– discarded –		
R371		– discarded –		
R372		– discarded –		
R373		– discarded –		
R374		– discarded –		
R375	1-242-656-	200Ω		
R376	1-242-690-	5,100Ω		
R401	1-242-727-	180 kΩ		
R402	1-242-731-	270 kΩ		
R403	1-242-693-	6,800Ω		
R404	1-242-666-	510Ω		
R405		– discarded –		
R406	1-242-690-	5,100Ω		
R407	1-242-677-	1,500Ω		
R408	1-242-701-	15 kΩ		
R409	1-242-673-	1kΩ		
R410	1-242-697-	10 kΩ		
R411	1-242-728-	200 kΩ		
R412	1-242-684-	3kΩ		
R413	1-242-686-	3,600Ω		
R414	1-242-645-	68Ω		
R415	1-242-721-	100 kΩ		
R416	1-242-680-	2kΩ		
R417	1-242-659-	270Ω		
R418	1-242-627-	12Ω		
R419	1-242-643-	56Ω		
R420	1-242-659-	270Ω		
R421	1-242-671-	820Ω		
R422	1-242-659-	270Ω		
R423	1-242-671-	820Ω		
R424	1-210-154-	1.5Ω	1W	carbon
R425	1-210-154-	1.5Ω	1W	carbon
R426		– discarded –		
R427	1-209-154-	33Ω	1W	carbon
R428	1-242-647-	82Ω		
R429	1-242-690-	5,100Ω		
R501	1-210-173-	43Ω	1W	carbon
R502	1-244-618-	5.1Ω		
R503	1-202-645-	1 MΩ	½W	composition
R504	1-210-173-	43Ω	1W	carbon
R601		– discarded –		

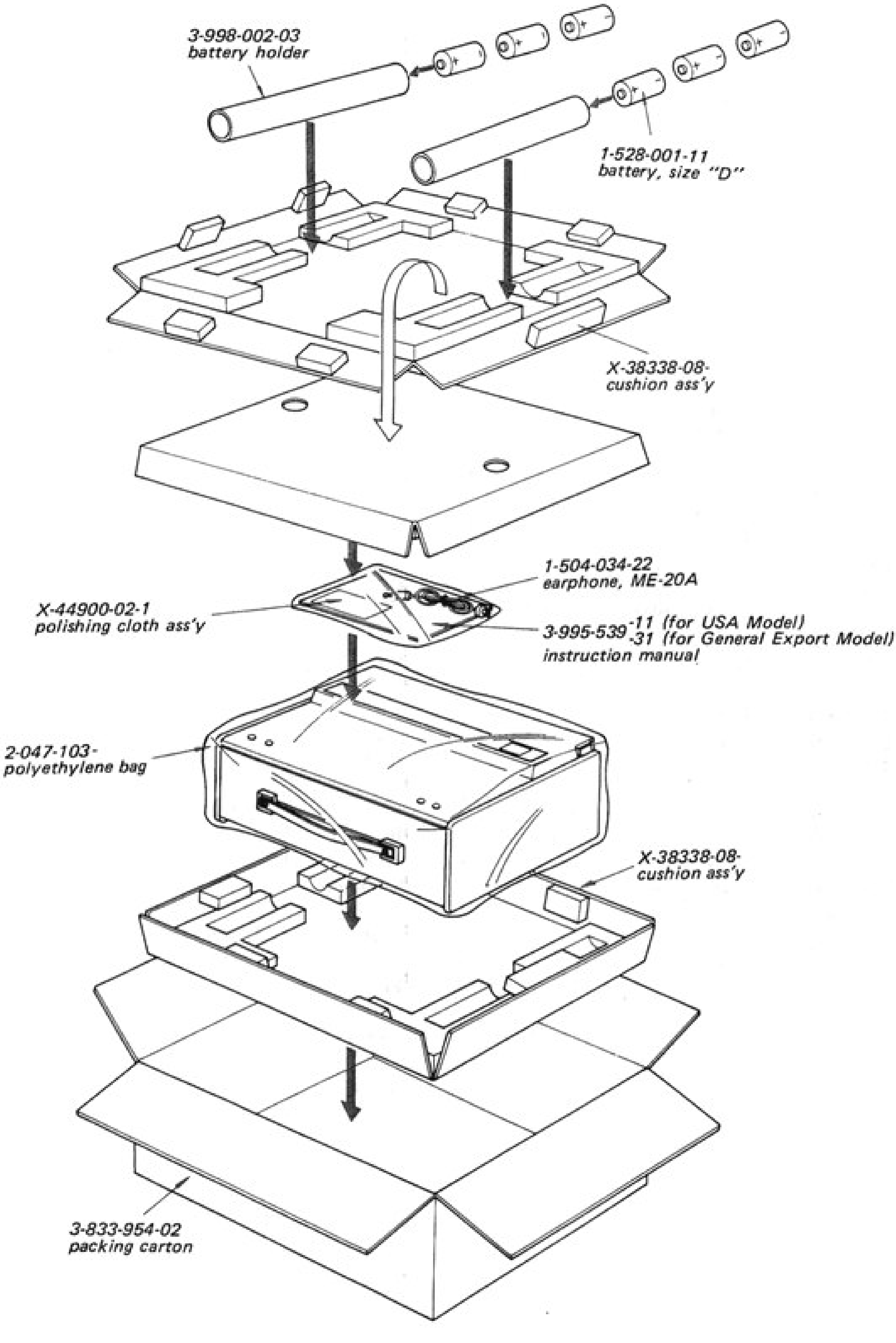
Ref. No.	Part No.	Description
R602		– discarded –
R603		– discarded –
R604	1-244-719-	82 kΩ
R605	1-244-673-	1 kΩ
RV601	1-222-218-	volume control 50 kΩ
RV602	1-222-126-	tone control 50 kΩ, treble
RV603	1-222-126-	tone control 50 kΩ, bass

MISCELLANEOUS

Ref. No.	Part No.	Description
	Y-38519-11-1	fm tuner block, FMC-094W1
	Y-38712-01-1	sw tuner block, SWC-021D1
	1-539-252-12	printed circuit board, cp/i-f
	1-539-253-11	printed circuit board, af
	1-539-254-11	printed circuit board, power supply
ROD601	1-501-113-	antenna, telescopic
S201-205		SW2–SW10 band selector, assembled in sw tuner
S301-305	1-514-670-	5 key switch, band selector
S306	1-514-594-11	push switch, SELECTIVITY
S501	1-514-503-11	lever seesaw switch, power ON-OFF
S502	1-514-269-	leaf switch, pilot lamp
S503	1-514-503-	lever seesaw switch, DC EXT power
S504	1-514-421-31	lever seesaw switch, AFC
S601	1-514-304-	slide switch, LOCAL-DX ANT
S602	1-514-304-	slide switch, EXT ANT-COD ANT
J501	1-509-362-11	connector, ac or ext dc power supply
J601	1-507-169-13	jack, MPX OUT
J602	1-507-169-13	jack, AUX IN
J603	1-507-169-13	jack, REC OUT
J604		– discarded –
J605	1-507-169-13	jack, earphone
J606	1-506-119-	2P jack, speaker
J606	1-507-148-	socket, 2P speaker connector
SP601	1-502-241-11	speaker
PL601	1-518-006-03	pilot lamp
PL602	1-518-006-03	pilot lamp
PL603	1-518-006-03	pilot lamp
PL604	1-518-006-03	pilot lamp
PL605	1-518-006-03	pilot lamp
VS501	1-526-168-	voltage selector (for USA and CANADA model)
VS501	1-526-188-	voltage selector (for general export model)
	1-520-195-	tuning meter
	1-534-517-11	ac cord with plug (for USA and general export model)
	1-534-517-12	ac cord with plug (for CANADA model)
	1-507-901-12	nut, earphone jack
	1-536-179-	lug terminal
	1-536-180-	lug terminal (C-2L2)
	1-536-178-	plate, lug (C-1L)

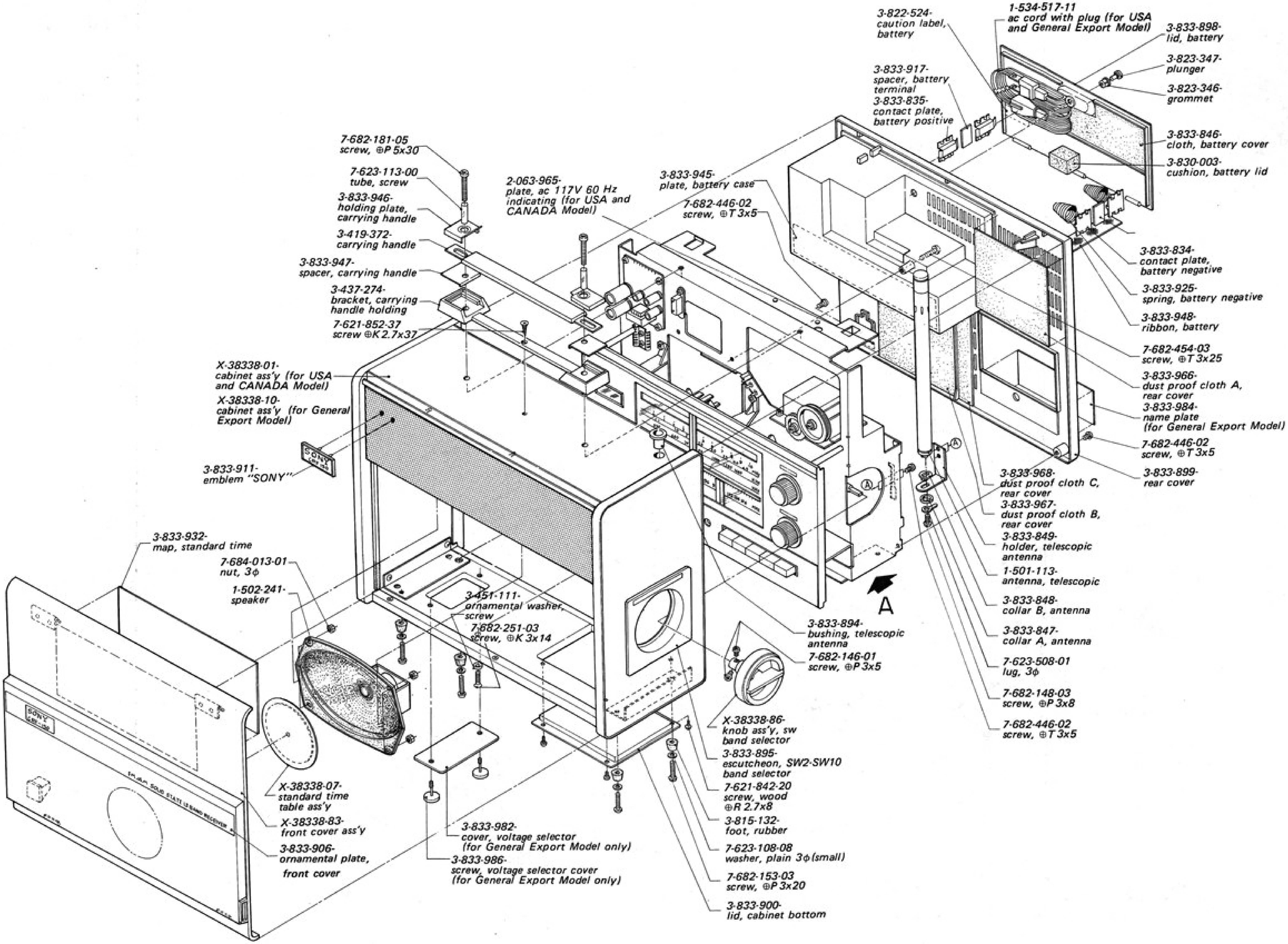
SECTION 6
PACKING AND EXPLODED VIEW

6-1. PACKING

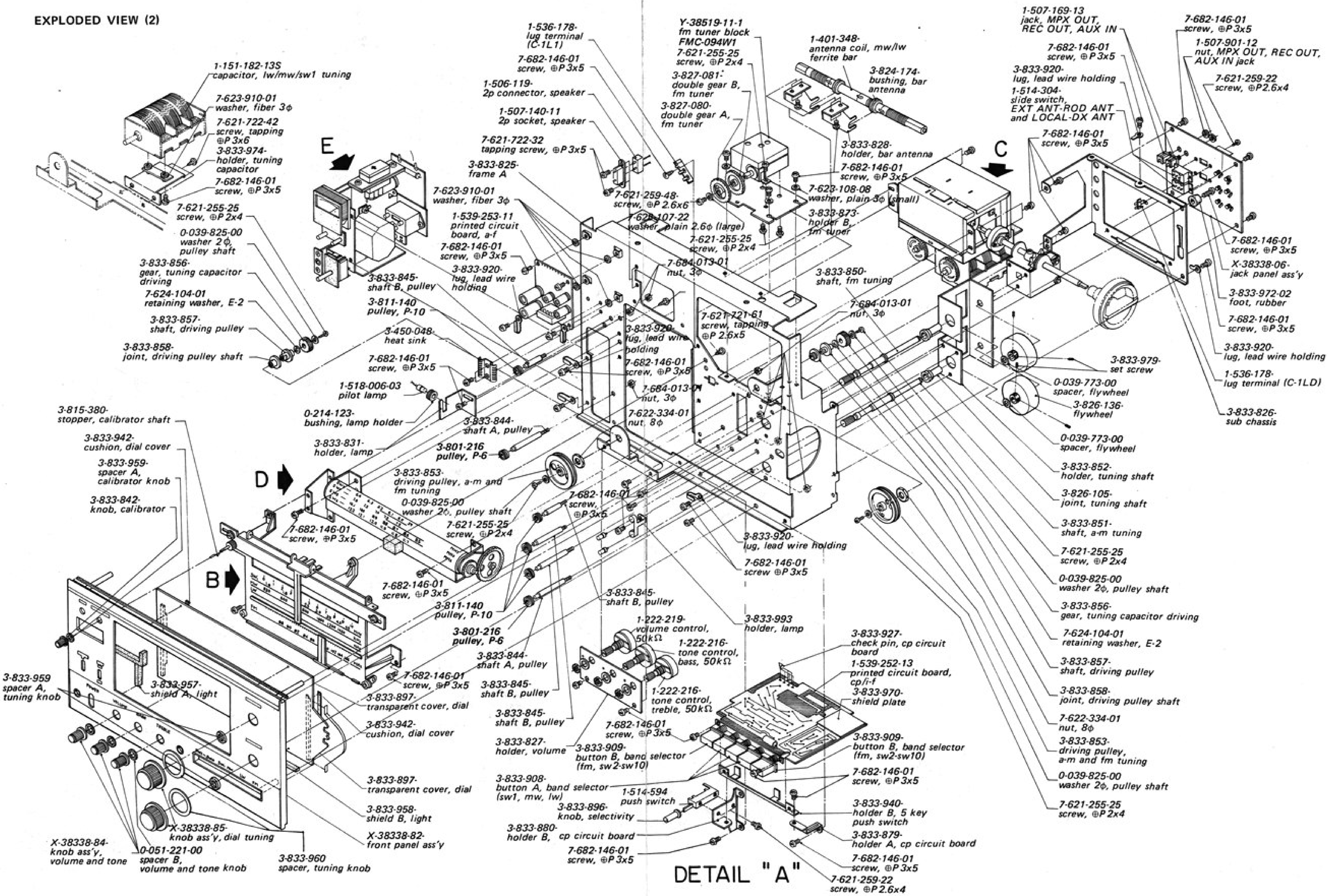


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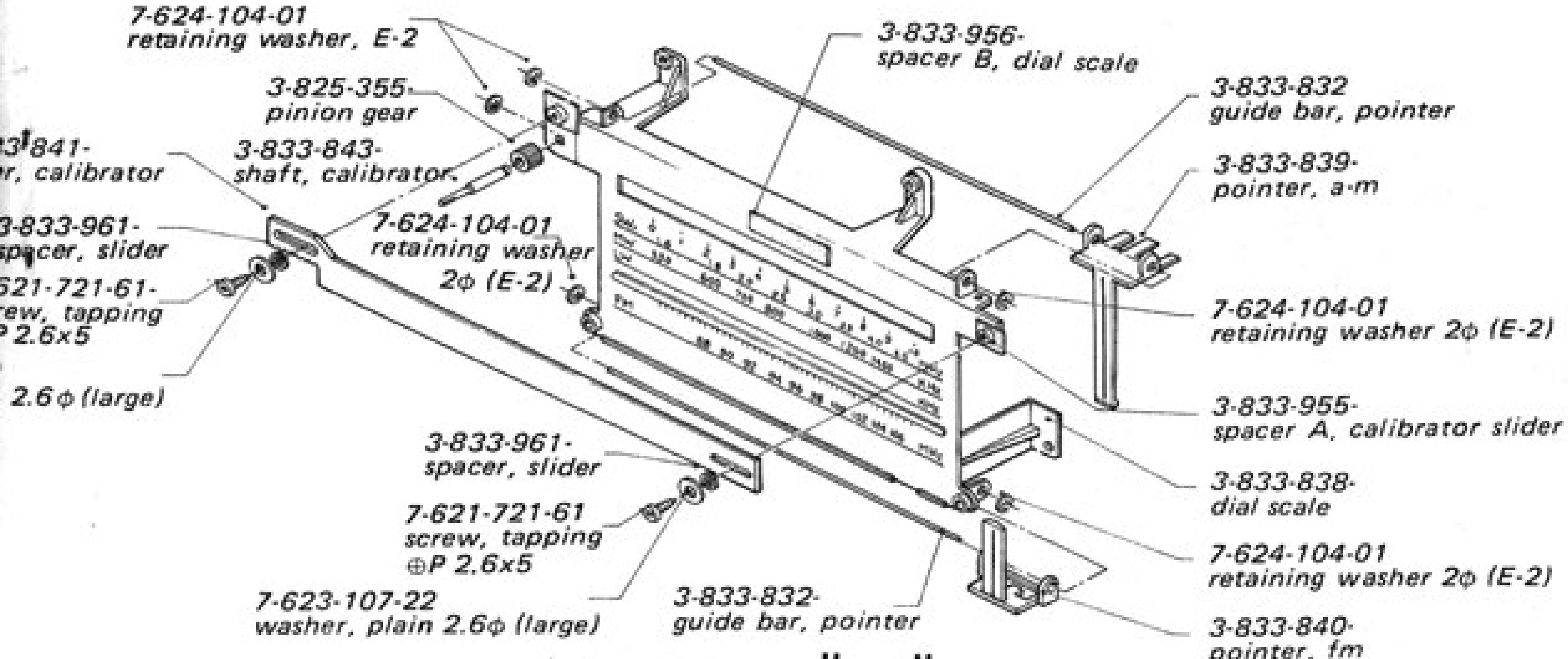
6-2. EXPLODED VIEW (1)



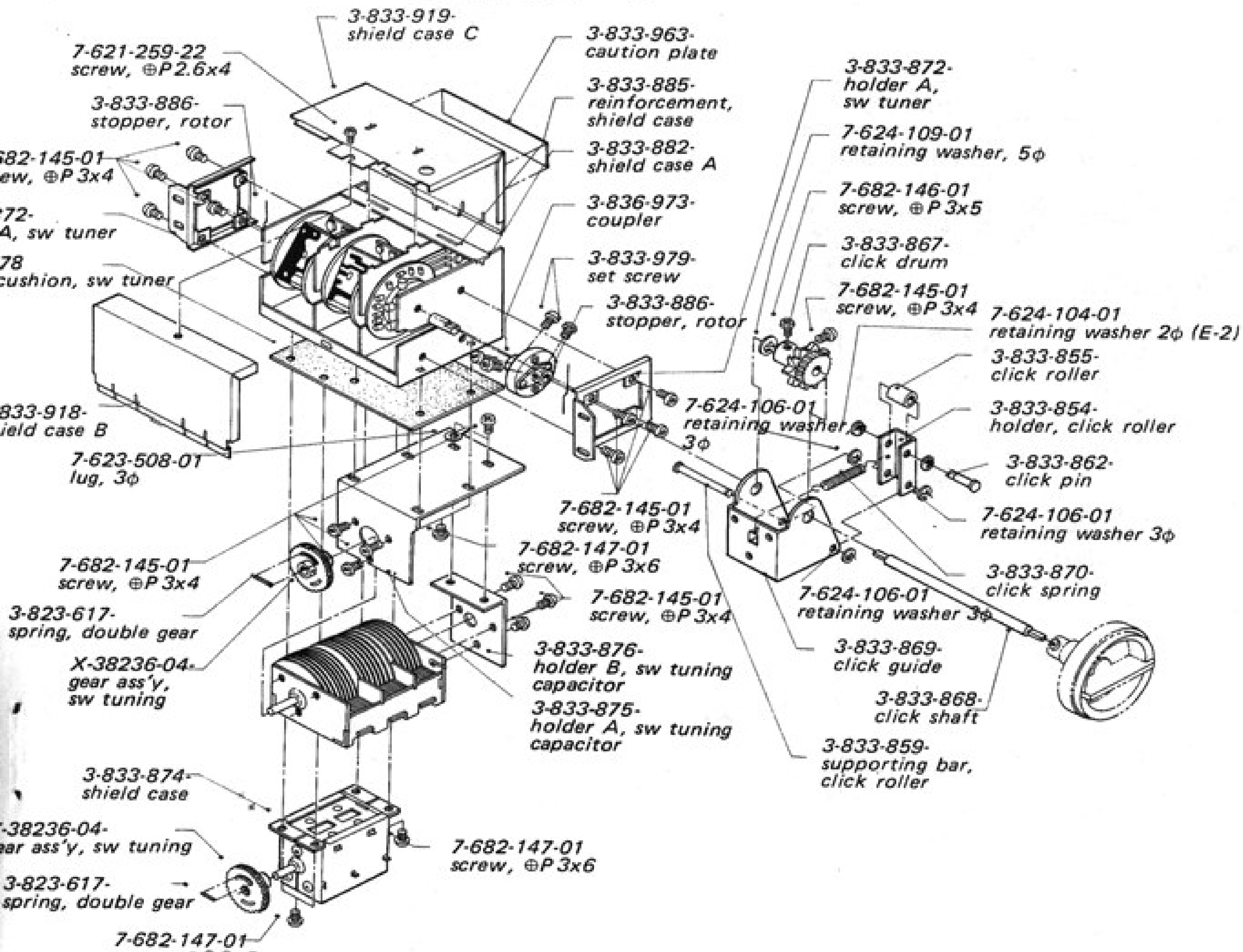
EXPLODED VIEW (2)



EXPLODED VIEW (3)

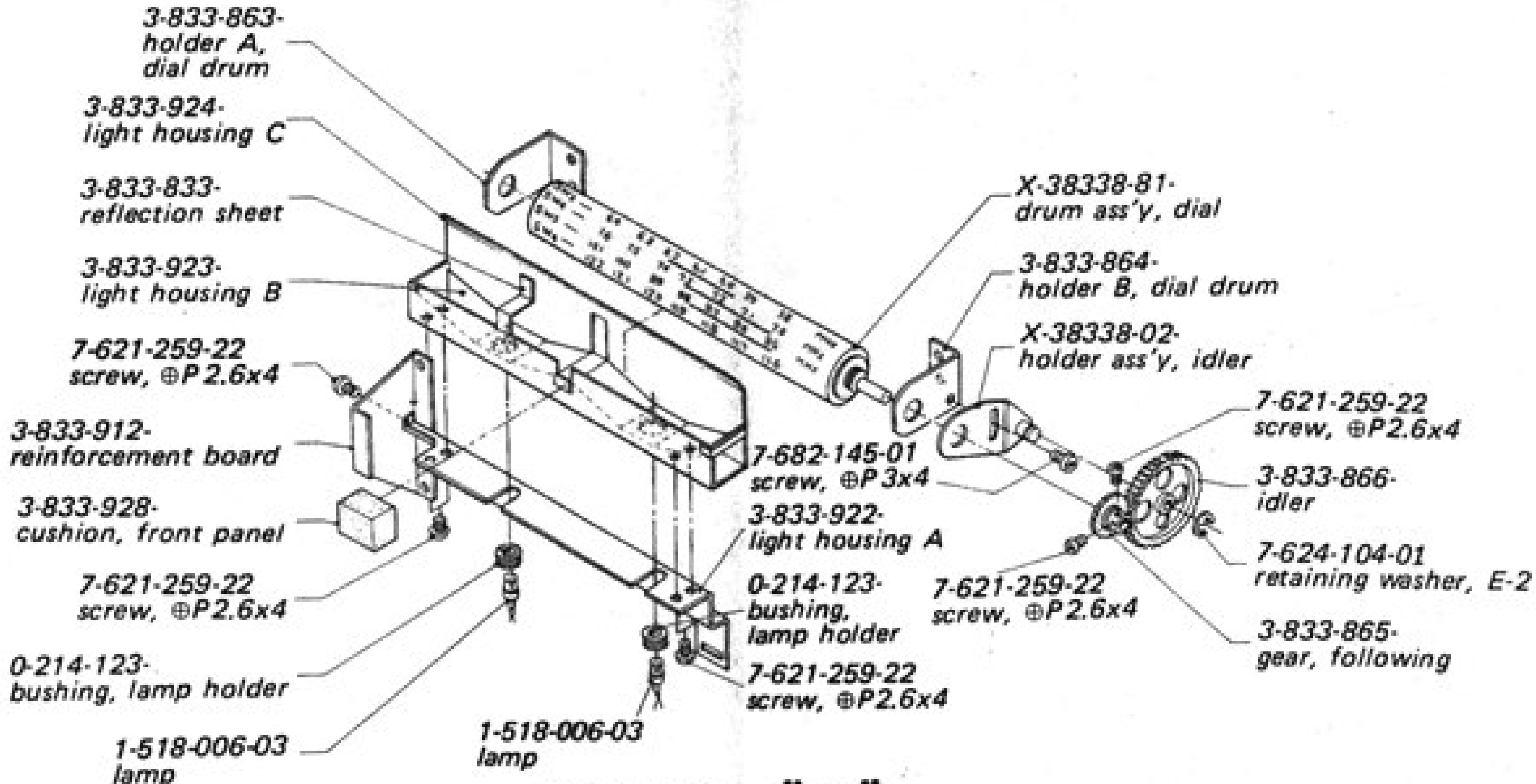


DETAIL "B"

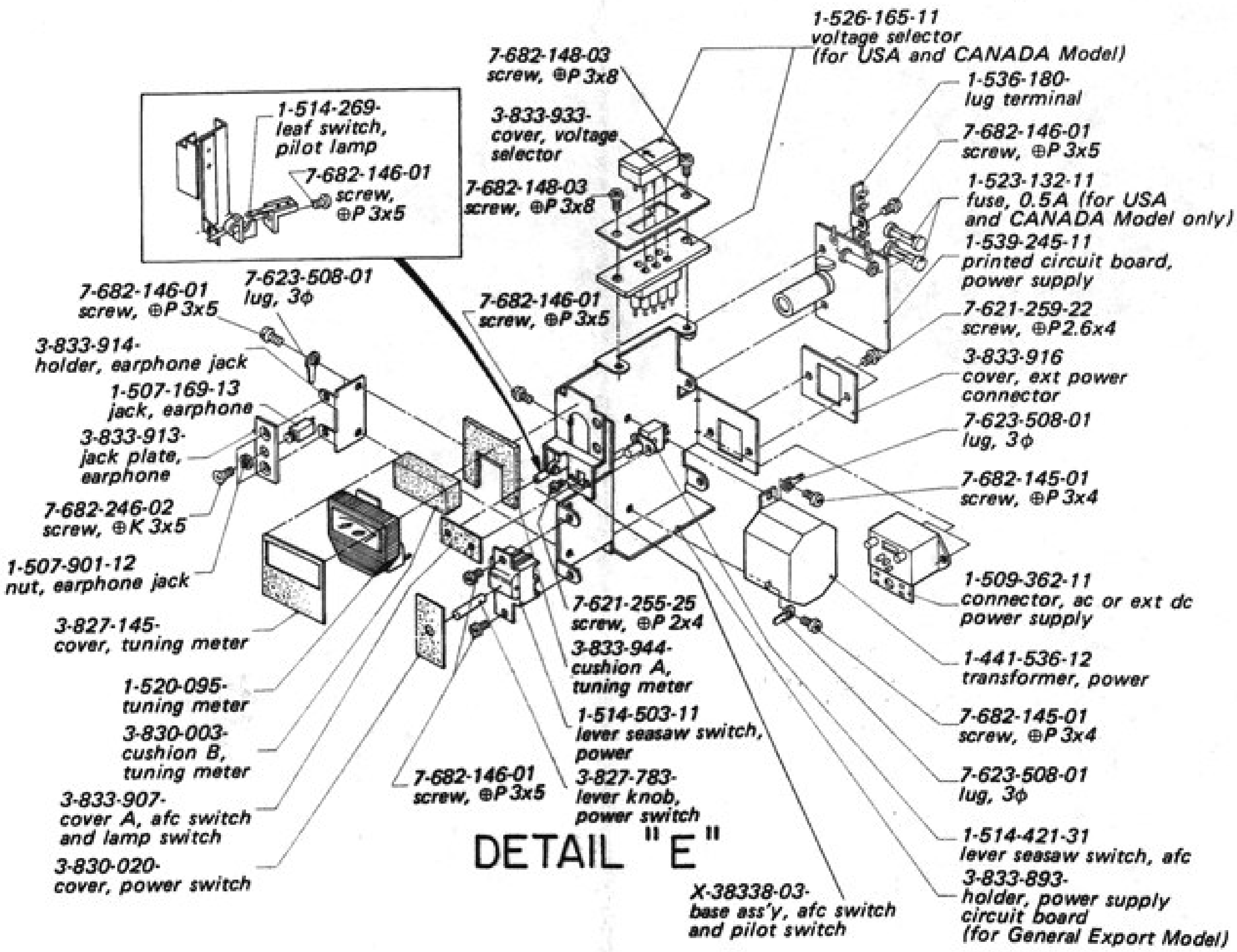


DETAIL "C"

EXPLODED VIEW (4)



DETAIL "D"



DETAIL "E"

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